COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, October, 1935

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Brightening Corners

LIGHT is saved by proper reflecting surfaces and in the permanent work of mines the use of whitewash is to be commended. The practice of the roads department of Pennsylvania is to add enough cement to make the whitewash adherent, but this makes the covering dull and less reflective of light. To correct this failing, bluing is added and a permanent, well-reflecting surface is said to be attained. Coal mines might well make this method of applying whitewash its standard practice—and, incidentally, apply the coating more frequently.

Explosive Silica

FOR MANY YEARS it has been recognized that the dusts of some silicon minerals are more harmful to human lungs than others, and recently stress has been laid on certain combined silica bodies which it is alleged are more harmful than free silica. Still more recently has come the suggestion that in the cavities which some silica contains is lodged much harmful potentiality.

Thus the quartz of some foreign mining operations, where silicosis is rife, contain roughly from 200,000 cavities to 3,000,000 cavities per cubic millimeter. These cavities are filled with a liquid, probably water or an aqueous solution, and liquid carbon dioxide. It is thought that in the mine the gas in the cavities is warm enough that its pressure is about a half ton to the square inch, so that, when the rock is rent apart by explosives, the work of comminution is further aided by the liquid gas within the cavity, which by its bursting pressure creates a far finer dust than would result from the explosion of dynamite.

Moreover, when silica gets in the lungs it is dissolved, weakening the cavity walls if they are not already disrupted. The temperature of the human body being high, though less high than that of the mine, the gas pressure may burst the cavity walls and fill the passages of the lung with the infinitely fine and glasslike particles of quartz resultant on the explosion. Such cavities are few in the quartz of the Kolar gold field and in that of the West African banket, and both fields are markedly free from silicosis.

These studies, made by A. B. Edge, suggest that some silica rock may be much less harmful than others, and his determinations may account in part for the relative freedom from silicosis of many coal regions where silica rock is encountered in tunnel work. This hopeful consideration, which is hypothetical, as Mr. Edge declares, however, must not be allowed to interfere with due precautions in the driving of tunnels.

Dump Fires

SPONTANEOUS COMBUSTION in stored coal has been prevented by running tractors over the coal as fast as it is spread, hauling behind the tractor a heavy steam roller. Thus coal for use in power plants and coke ovens has been prevented from firing, and coking coal, which normally becomes so oxidized as to be unavailable for making strong coke, has been kept without deterioration.

This fact seems significant of what might be done in the wasting of rock, boney and coal on the surface, though rock has the defect that, being large, it does not pack so tightly as fine coal. Tractors and rollers might not be necessary if only thin layers were spread and the waste material was hauled in motor trucks that would press down the deposited material to refusal. Too often waste, subject to spontaneous combustion, is loosely piled by conveyors or

dumped from tracks so that voids are inevitable. Where fine coal for which no sale has been found is available from washers, such coal could be used to fill voids and thus consolidate the dump. Whether in all cases these suggestions would meet the problem is a matter for test. Clay also is sometimes used to render dumps less subject to combustion.

In Indiana a mine had frequent dump fires until it introduced motor-truck disposal. The motor truck continually sought an unrutted pathway and so kneaded the entire dump into a compact mass. Since then there have been no dump fires and, what is more, rock disposal was found to be relatively inexpensive.

In the News

As THESE LINES are written bituminous mines which have been operating under U. M. W. contracts are down and weary Appalachian wage-scale committeemen are still in session at Washington, battling over the last 1.5 cents concession. The first court attack on the Bituminous Coal Conservation Act of 1935 has been sidetracked by a decision which touches none of the fundamental issues raised and the forum for effective legal debate has been transferred to Louisville. Thus labor and law become the outstanding questions of the day in the soft-coal industry. Since both questions, however, are at such a fluid state that editorial comment on the situation of the moment probably would seem academic observations on dead phases of live issues before Mr. Farley's swift couriers could deliver this issue of *Coal Age* to its readers, editorial discussion must perforce be withheld.

Catalysts Supreme

DIFFERENT as is one coal from another, coaly substance is not nearly so variant as its mineral impurities. No wonder, therefore, that German chemists have found great differences in the agricultural values of lignites. Impurities in coal are dependent on the soils in which the coal grew, on the variant waters that entered the peat bogs and on the ground waters that later passed through the crevices of the coal seams.

Into the vegetal mass, silica entered generously; alumina seems, quantitatively at least, to have taken little part, whereas copper, boron and manganese, though appearing in small quantity, seem to have an important bearing. According to J. W. Shive, New Jersey Experimental Station, sand treated with hydrochloric acid and washed so as to free it from anything that would feed plants, and then fed with potassium, magnesium, nitrogen, sulphur, phosphorus and calcium, permitted radishes to develop, but in a few weeks they were dead, whereas boron and manganese helped them to abundant life, whether as catalysts or fundamental plant constituents.

Dr. Nieuwland and others have been wondering and striving to find what in the alchemy of nature makes it possible for plants and animals to effect reactions at low temperatures and pressures, which chemists can achieve, even with catalysts, only at high heat, many atmospheres and much uncertainty. Perhaps suggestions may be derived from tests such as these, but it may be that violet and ultra-violet rays, or perhaps ray sequences, may be needed. Time also, alas, may have a disconcerting part in these natural processes.

Before Collapse

TOO MANY mines run their cutting and loading equipment until it breaks down, with only minor repairs and inspection in the interim. As a result, when the break occurs serious damage usually has been done. Even then an effort is made to effect the necessary repairs in haste, in the working face where the break occurs, with insufficient lighting, imperfect cleaning and inadequate space, often with makeshift tools and unsuitable supplies, so that the corrective work removes only some of the disabilities, and other breakdowns occur or the machine operates inefficiently.

Better it would be from records to establish a time that a machine in condition might be expected reasonably to operate without major trouble and then bring it to the company shop, have it cleaned, inspected and repaired under favorable conditions and subject to the approval and inspection of the master mechanic or electrical engineer, thus insuring that the work done would be effective, performed at convenient times and without undue interference with operating schedules. Those companies which have adopted this operating practice have found it profitable.

HAULAGE RECORD

+ Reflects Long-Time Improvement Program At Lehigh Navigation Collieries

By IVAN A. GIVEN
Associate Editor, Coal Age

UNDERGROUND transportation at the collieries of the Lehigh Navigation Coal Co., Lansford, Pa., has been marked by a continuous revision in equipment, operating methods and maintenance practices with the dual objectives of increased efficiency and lower cost. Mechanization of underground haulage at the various properties of the company through the installation of electric locomotives started nearly thirty years ago, and, to insure sufficient flexibility to meet the various conditions encountered, underground equipment purchases since that time have included a substantial number of battery units. Use of this type of locomotive has caused a steady increase in battery life.

Steel mine cars entered the company's transportation picture only a few years after electric locomotives, and in 1920 Lehigh Navigation pioneered the use of the cast-steel underframe as a means of increasing mine-car life and lowering maintenance cost. Now, this type of underframe with roller bearings is standard on all cars used underground at four of the company's seven active properties, and are supplemented in many instances by special wheels and axles and other modern auxiliaries.

Coal beds at the Lehigh Navigation collieries, of which the principal one is the Mammoth, averaging about 40 ft. in thickness, generally lie at an angle in excess of 45 deg., and in many cases are vertical or nearly vertical. Flat, or nearly flat, areas of coal seldom are encountered. In view of the heavy pitch, chute mining with batteries is the standard system. No underground planes (down which loaded cars are lowered) or slopes (up which loaded cars are hoisted) are employed, development being based on the use of rock tunnels driven from shaft landings or drift openings across the measures to cut the various beds at approximately right angles. From these cross-measure tunnels, gangways, from which the beds are mined, generally are turned to the right and left.

Provision for drainage is made in driving both rock tunnels and gangways. To facilitate the flow of water to central points, these openings are driven on a minimum upward gradient of 0.35 per cent. Standard gradient is 0.58 per cent. Ditches 3 ft. wide are constructed along one rib in all tunnels and gangways (Figs. 2, 3 and 4). Depth of these ditches, measuring from the rail top, is 24 in. While some 40-lb. rail was used in the past, present standards call for use of 60-lb. rail on wood ties spaced 20 in. apart on all haulways. Tracks are ballasted with mine rock or cinders. Minimum curve radius is 50 ft., varying from this figure up to 100 ft., with certain exceptions to meet unusual conditions.

Electrification of underground haulage at Lehigh Navigation collieries started in 1906 with the purchase of an 8-ton Westinghouse trolley locomotive. This locomotive, the first in the Panther Creek Valley, still is in service. At the present time, 130 electric locomotives of all types are employed at the seven collieries on the active list (Table I), and haulage accounts for an energy consumption (including certain small loads credited to d.c. equipment operating off the trolley) of 2.324 kw.-hr. per ton. Demand credited to haulage is 3,800 kw. at the present time, as compared with a total demand of 27,398 kw. for all operations.

Of the total of 130 locomotives in service, 96, including main-haulage units, are of the trolley type. The predominance of trolley units arises from the fact that gathering at Lehigh Navigation collieries, in view of the mining system in use, largely is a matter of setting cars under the various loading chutes along a gangway and then assembling them into trips when loaded. It is therefore possible as a general rule to carry trolley wire and bonding up close to the face of the gangway.

Straight storage-battery or combination locomotives comprise the second largest class of equipment, numbering 32. These units, as well as two flameproof cable-reel locomotives, occupy a definite place in the Lehigh Navigation

Fig. 1—Track Construction at Lehigh Navigation collieries is based on the use of 60-lb. rail and wood ties

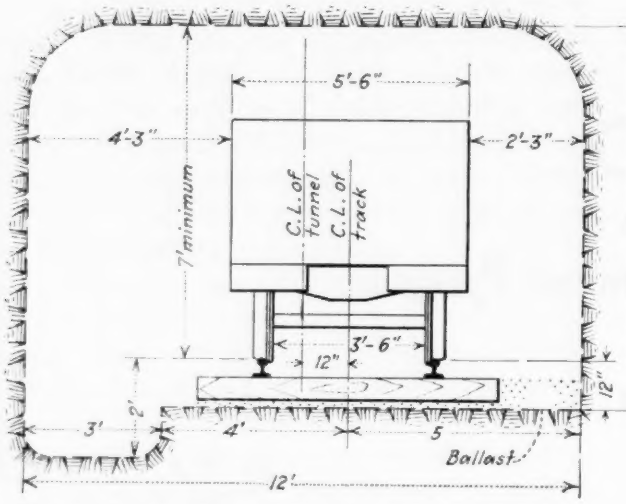


Fig. 2—Section of single-track rock tunnel or gangway

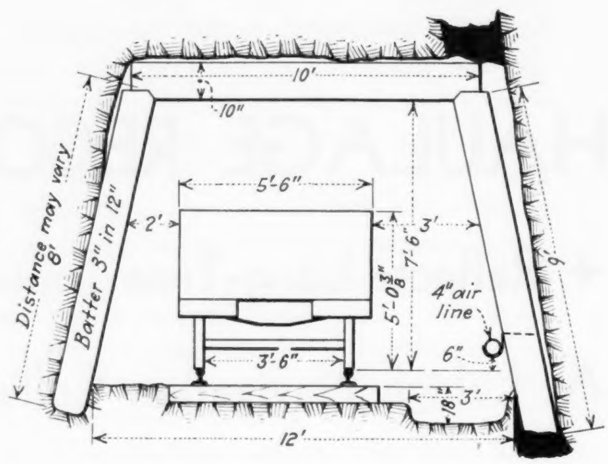


Fig. 3—Typical thin-vein gangway and standard ditch

haulage program, as they are adaptable to use in places where gas may be a hazard or where keeping trolley wire up to the face may be difficult or inexpedient or, particularly in the case of battery units, in the development of short-lived sections which otherwise would involve an unduly high cost for installation of motor-generator sets, trolley wire, bonding, etc.

As a general rule, locomotives haul directly from the loading chutes in the gangways to the shaft landing or dump. Usually, the haul is not over 3,500 ft., although occasionally distances up to 10,000 ft. are encountered. Where the haul is over 3,500 ft., however, the general practice is to assemble the cars on a turnout, or parting, usually made by widening the tunnel or gangway sufficiently to accommodate two tracks (Fig. 4), where they are taken in charge by a main-line unit. As indicated above, grades generally are in favor of the loads, although this does not always follow, particularly in the case of gangways with a relatively long life, where caving following extraction of the coal may result in distortion of the openings and the creation of sharp grades for short distances.

Locomotive maintenance methods at Lehigh Navigation collieries are based on the accepted principle of prevention of trouble rather than cure. Responsibility for the repair of motive equipment is divided between colliery staffs and the central shops maintained by the electrical and mechanical departments, under the direct supervision of the electrical and mechanical engineers, at Lansford. Under this system, routine repairs are made at the collieries, while heavy electrical and mechanical repairs are delegated to the central shops. Responsibility for inspection of locomotive equipment is divided in a somewhat similar manner. Each locomotive runner is charged with the duty of inspecting his machine each day, and these inspections are checked by regular examinations by colliery electricians.

In addition to the regular inspections at the colliery, each locomotive receives a thorough examination approximately every three months by a full-time locomotive inspector, who reports to an assistant to the electrical engineer. Five copies of the inspector's report are made by the assistant, who retains one for follow-up purposes and distributes the remainder to the following: electrical engineer, district superintendent in the district in which the colliery is located, the mechanical superintendent in the general offices, and the assistant electrical engineer to whom the colliery electricians report, thus giving all interested operating and maintenance officials an opportunity to study and act on the findings of the inspector. Since this system was inaugurated, cost of major electrical repairs to locomotives has been reduced 50 per cent.

The locomotive inspector also is available to assist the colliery staff in any special problems connected with locomotive maintenance, and his work is supplemented by a wiring and bonding inspector, who also checks the condition of stationary electric motors at each colliery. Addition of the wiring and bonding inspector, who also reports to the assistant to the electrical engineer, to the general staff permits an attack on one of the causes of excess equipment maintenance at the source.

Locomotives receive general overhauls when their condition warrant, and in any case when transferred from one colliery to another, in which case they pass through the central shops. The central electrical and mechanical shops follow the general plan of building up armature shafts and axles by welding if they are found to be worn when trucks or armatures come to the shops, after which they are turned down to

Table I—Type and Number of Electric Locomotives at Lehigh Navigation Collieries

Trolley	Cranberry	Nesquehoning	Lansford	Coaldale	Greenwood	Tamaqua	Alliance
General Electric, 20-ton	..	1	..	4	..	..	..
Goodman, 20-ton	..	1	..	1	..	..	..
Westinghouse, 20-ton	..	1	1	..	..	..	..
General Electric, 15-ton	..	3	4	1	2	2	..
Goodman, 15-ton	2	..	..	..	..	..	..
Westinghouse, 15-ton	..	4	..	1	1	..	..
General Electric, 8½-ton	2	8	13	18	6	8	2
Jeffrey, 8-ton	..	..	..	..	1	..	..
Westinghouse, 8-ton	..	..	..	1	..	1	6
Westinghouse, 6-ton	10	..	..	..	..	..	..
Cable-Reel							
Goodman, flameproof, 8-ton	..	2	..	..	..	..	..
Storage-Battery*							
General Electric, 8-ton	..	1	..	..	..	..	..
Gen. Elec. permissible, 8-ton	..	..	1[1]	..	..	..	..
Mancha, 6-ton	..	..	2	3	..	..	..
Ironton, 5½ ton	..	..	..	..	3[2]	..	..
Mancha, 5½-ton	..	..	..	..	..	1	..
Ironton, 5-ton	8	..	..	..	..	..	..
Mancha, 5-ton	1	..	..	..	..	..	..
Vulcan, 5-ton	1[3]	..	..	..	..	..	..
Vulcan, 2-ton	..	..	..	..	..	1[4]	..
Combination†							
Westinghouse, 10-ton	..	1	..	3	..	2	..
Whitcomb, 8-ton	..	..	1	..	1	..	..
General Electric, 7-ton	..	..	2	..	..	..	..
Total	24	22	24	32	13	15	8

*All battery locomotives, except as specifically noted, equipped with 42-cell, 29-plate Exide-Ironclad batteries.
†All equipped with 88-cell 17-plate Exide-Ironclad batteries.
[1]Equipped with extra battery for double-shift duty. [2]Includes two units equipped with A-14 72-cell Edison nickel-iron-alkali batteries. [3]Equipped with two 42-cell 29-plate batteries—Exide-Ironclad and Exide-Hycap. [4]Equipped with two 24-cell 13-plate Exide-Ironclad batteries for double-shift duty.

proper size. Experiments are now being conducted to determine the feasibility of filling worn locomotive tires and wheels by electric welding as a means of prolonging life. At present, however, tires and wheels usually are turned once and then discarded. Second turning generally is avoided because of excessive reduction in clearance between gear cases and roadbed.

Primarily as a means of checking the tendency to add cars as long as the locomotive continues to run at a good speed, with consequent overloading, drop-tooth pinions are being installed in trolley locomotives—so far—as fast as they are overhauled. This results in a speed reduction of approximately 8 per cent, and has helped materially in reducing the effects of habitual overloading.

Battery locomotives, in addition to the general inspection and maintenance attention given to other types, are examined approximately every six months by representatives of the battery manufacturer, who renders a report and recommendations. Except at Cranberry colliery, where Wotton motor-generator sets and automatic panels are employed, battery locomotives are charged off the trolley (250 to 275 volts) through Wotton charging rheostats. Charging takes place in two steps: approximately 80 per cent at full rate and the remainder at a lower finishing rate. Transfer from full to finishing rates is made automatically. Equalizing charges are given once a week when the locomotive is in active service, and care is taken where batteries are idle temporarily to keep them in a fully charged state as a means of checking sulphation.

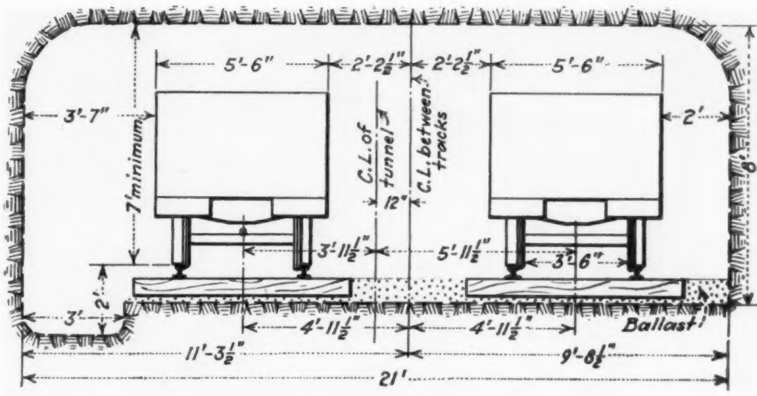


Fig. 4—Section of double-track tunnel or turnout

Including extra batteries for three locomotives working on double-shift schedules, the 32 battery and combination units at Lehigh Navigation collieries employ a total of 35 batteries (Table I). Exide-Ironclad batteries predominate, all but five of the power units for the straight battery locomotives consisting of 42-cell 29-plate batteries of this type. The ten combination locomotives are equipped with 88-cell 17-plate Exide-Ironclad batteries.

On straight battery locomotives, average life of batteries was 54 months, giving an average monthly cost, based on an average battery cost of $1,696.20 (including freight charges, installation cost, special repairs, if any, and scrap value or allowances), of $31.41. On combination locomotives, average monthly

Developments in cast-steel underframe design for Lehigh Navigation cars

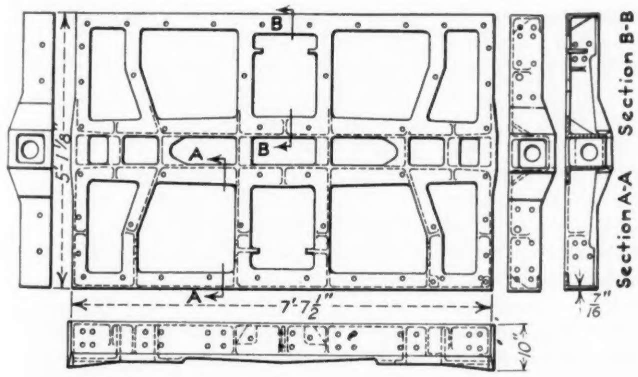


FIG. 5 - Details of original cast-steel underframe without pedestals or bottom

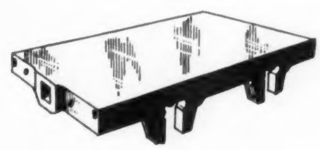
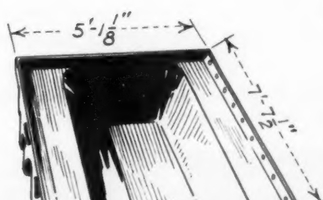


FIG. 6 - Early frame with integral pedestals and flat bottom



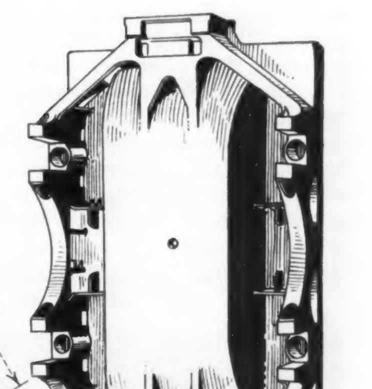


FIG. 7 - Two views of "bath-tub" underframe

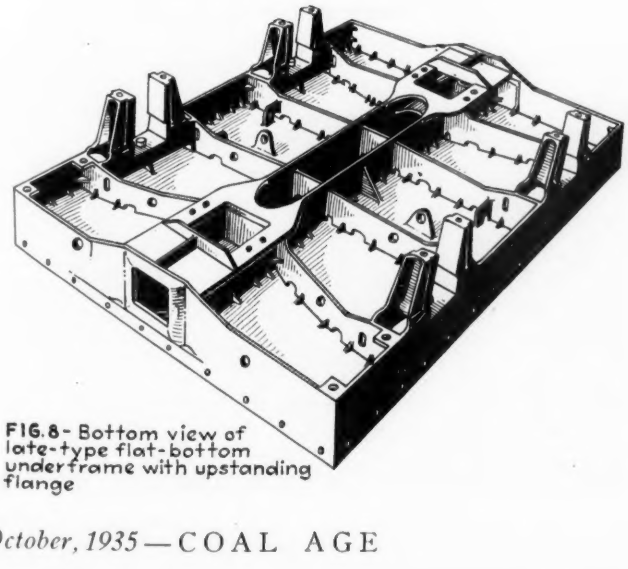


FIG. 8 - Bottom view of late-type flat-bottom underframe with upstanding flange

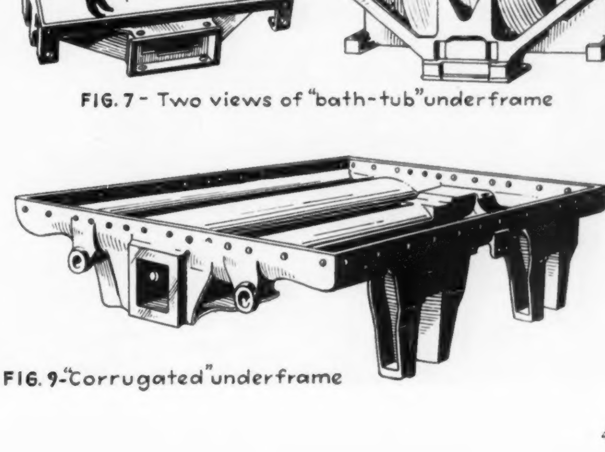


FIG. 9 - "Corrugated" underframe

Fig. 10—Cars, right to left, with "bathtub," flat-bottomed with upstanding flange and flat-bottomed cast-steel underframes with pedestals, respectively. View shows reduced depth of side and end plates with the newer underframes

cost was $45.22, based on an average life of 46 months and an average cost of $2,080.05. The relative life of the two types of batteries reflects in the main the inherent difference between the two types of locomotives, combination batteries being subject to more overloading due to the ability of the locomotives to start heavy trips on the trolley, which the battery is called upon to handle beyond the wire. Present battery life reflects largely continued research on suitable types and improvements in the art of battery manufacture and maintenance in service, as compared with the period 1920-24, when the average life of the type of battery then in use was 24 to 30 months.

Of the several elements entering into transportation at Lehigh Navigation collieries, perhaps the most striking is the progressive evolution in mine-car design for the purpose of increasing service life and reducing maintenance cost. In this evolution, mining conditions have played a prominent part. As indicated above, chute mining is the predominant method at the various collieries, which means that all material coming from the chute spout must drop at least 5 ft. to the bottom of the mine car. Also, in chute mining, all material that goes into a battery must be drawn out, and in spite of the fact that an effort is made to break down larger pieces of coal and rock, chunks weighing as much as a ton occasionally are loaded. Thus shock becomes an important factor in mine-car design, to which must be added the corrosive effects of acid mine water. These factors have resulted in the development of all-steel mine cars with cast-steel or welded underframes, spring or friction-type draft and buffing gear, special axles and wheels, and roller bearings.

Early mine cars employed by the company were made entirely of wood, except for the running gear and hitchings. This type gave way to the composite, or semi-steel, car type, consisting of a wooden underframe and fabricated steel body. While an improvement from the standpoint of rigidity and reduction in maintenance expense, changing transportation conditions (including progress in the adoption of locomotive haulage and an increase in size of material being loaded) dictated a change to a stronger construction, which was found in the adoption of a fabricated structural-steel underframe—the last step in the trend to an all-steel car. However, this type of construction, although an improvement over the composite car, was open to the objection that the loosening or stretching of the rivets allowed the entrance of acid water, which rapidly enlarged the rivet holes and speeded the disintegration of the car. Average life of cars with structural - steel underframes ranged from three to four years, and one special study showed the maintenance cost to be 7c. per ton of material hauled.

In 1919, in an attempt to eliminate the disadvantages noted above for the structural steel underframe, the company installed its first cast-steel underframe. Now, all the cars in use underground at four of the company's collieries in the Panther Creek Valley, with the exception of 100 equipped with all-welded underframes, are provided with cast frames. These collieries, and the number of cars at each, are: Lansford, 450; Coaldale, 1,200; Greenwood, 560; Tamaqua, 560. Experience has indicated that adoption of cast underframes, together with other improvements, has reduced maintenance cost 50 per cent, and in the special study cited above, maintenance of a modern car with cast frame and other improvements was found to be 2.1c. per ton.

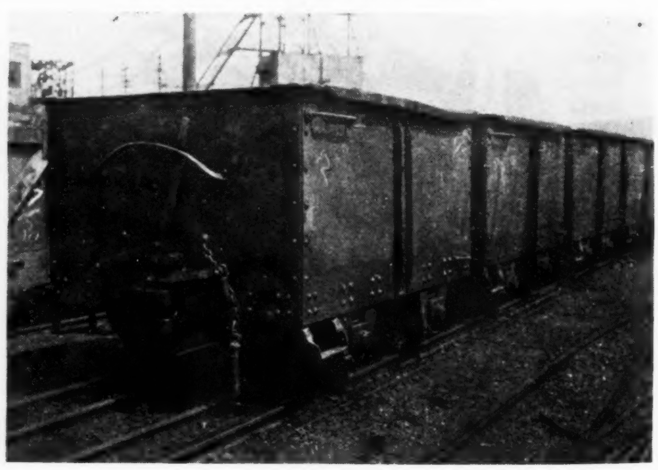
To fit in with standard gangway and tunnel specifications and chute location, mine-car height has been standardized at 5 ft. ⅜ in. over the rail, this with a standard wheel diameter of 20 in. Other dimensions are: length over bumpers, 9 ft. 4 in.; body length, 7 ft. 7½ in.; width, 5 ft. 1⅛ in. Track gage is 42 in. Capacity in most cases is 114.87 cu.ft. level full, although increases were marked up in the case of some of the newer types of underframes.

The first cast-steel underframe installed on Lehigh Navigation cars (Fig. 5) was in effect a reproduction of the structural-steel frame in cast steel. The casting included side sills, end sills and draft sills, and to this frame were

(Turn to page 421)

Fig. 11—Mine car with all-welded underframe complete with pedestals and flat bottom

Fig. 12—Lansford car with cast-steel underframe, brakes, special wheels, and roller bearings



[FIRST OF A SERIES OF ARTICLES ON DEWATERING WASHED COAL]

DEWATERING COAL

+ Receives Greater Stress in Preparation With Rise of Wet Washing

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and S. M. PARMLEY
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THE RAPID development and widespread adoption of wet-washing methods during the last few years has caused a corollary development of dewatering equipment. Due to the different water-absorbing qualities of coarse and fine coal, the problem of dewatering is a dual one. For the present purpose we shall define "coarse coal" as over ⅜ in. with a top size of 4 in., and "fine coal" as less than, say, $\frac{7}{16}$ in., with 5 to 20 per cent of minus 48-mesh material.

In coarse coal, the moisture is largely on the surface, easily shaken off, and dries quickly. In fine coal, the moisture below a certain point—let us say 5 per cent—is held between the individual smaller particles, is not easily shaken off by ordinary means, and requires some length of exposure to dry.

The water used in washing usually delivers the fine coal to a screen or an elevator boot, and here the problem of dewatering begins. There is a choice of these methods: screening, centrifugal drying, and heat drying. As this last method has been fully treated elsewhere, it will not be considered here.

Many screens have been marketed for the dewatering of fine coal and many more are in the process of development. At present, however, the use of hanger screens with round-hole, cloth or wedgewire screens is prevalent. Unfortunately, the moisture of the overproduct from screens cannot be much below the "free-moisture" point of the coal; because of this, other methods are receiving greater attention. In many plants the water is partially removed from the fine coal by large draining bins or pits. These, however, require hours to attain a reasonable reduction in moisture, take up considerable space, and require a high capital expenditure. Large tonnages necessitate considerable handling equipment, with its subsequent operating and maintenance costs. Moreover, the water drains from the top layers and concentrates in the bottom of the bin, thus giving a variable product. In large-tonnage plants where a uniform moisture content is required, drainage bins are generally unsatisfactory.

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The object of this paper is not to compare the merits or shortcomings of various dewatering devices, nor to enter upon any theories concerned, but merely to set forth data and experience which may prove interesting or instructive to others. A large part of this information has been obtained over a four-year operating period of three of the Champion cleaning plants of the Pittsburgh Coal Co., where the writers have been closely identified with the dewatering of products from wet preparation.

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The centrifuge has been highly developed for dewatering sugar, chemicals, salts, grains, etc., and in these fields is generally, although not always, recognized as a more practicable and satisfactory method. The machines used have usually been of the intermittent type. For the commercial drying of coal it is essential to have a machine of a continuous type in order to give a more uniform moisture content as well as consistent physical and chemical properties. In addition, and bearing in mind the low price of the product when compared with the products named above, the machine should also have the following characteristics: (1) a large capacity, (2) a low maintenance and operating cost, (3) high water removal, (4) small loss of coal into the effluent, (5) low power cost per ton of coal treated and (6) the lowest possible breakage of plus 4-mesh material into the smaller sizes.

The types of centrifugal machines placed on the market may be divided into two general classes: (1) horizontal-axis type, such as the Laughlin, Habermann, Termeer, and Humboldt, and (2) vertical-axis type, such as the Carpenter, Bamag-Mequin, Hoyle, and Fesca. Present practice in the United States favors the vertical-axis type.

Some machines of both types have a differential drive, which not only actuates the scraper for removing the coal from the machine but retains the material for a period of time. These machines are usually complex, having a large number of working parts. The scraping action, due to the differential motion, causes considerable wear on screens and scrapers.

The Pittsburgh Coal Co. has three wet-preparation plants: Champion No. 1, preparing coal for steam and domestic markets, and Champion Nos. 4 and 5, both of which prepare a gas or by-product coking coal. The Rheolaveur washing system is used in all plants and in most respects the auxiliary units are similar.

Coarse coal, on leaving the washing units, is sized and dewatered on shaker screens of the flexible hanger type, from which it passes onto band conveyors running 60 to 100 ft. per minute, and thence to loading booms or chutes. In addition to the dewatering accomplished by screening, the troughs of the band conveyors are equipped with steel wedgewire in 3-ft. sections spaced every 8 ft. along the conveyor. The conveyor bottom between wedgewire sections consists of blank plate, allowing water to drain and squeeze out of coal

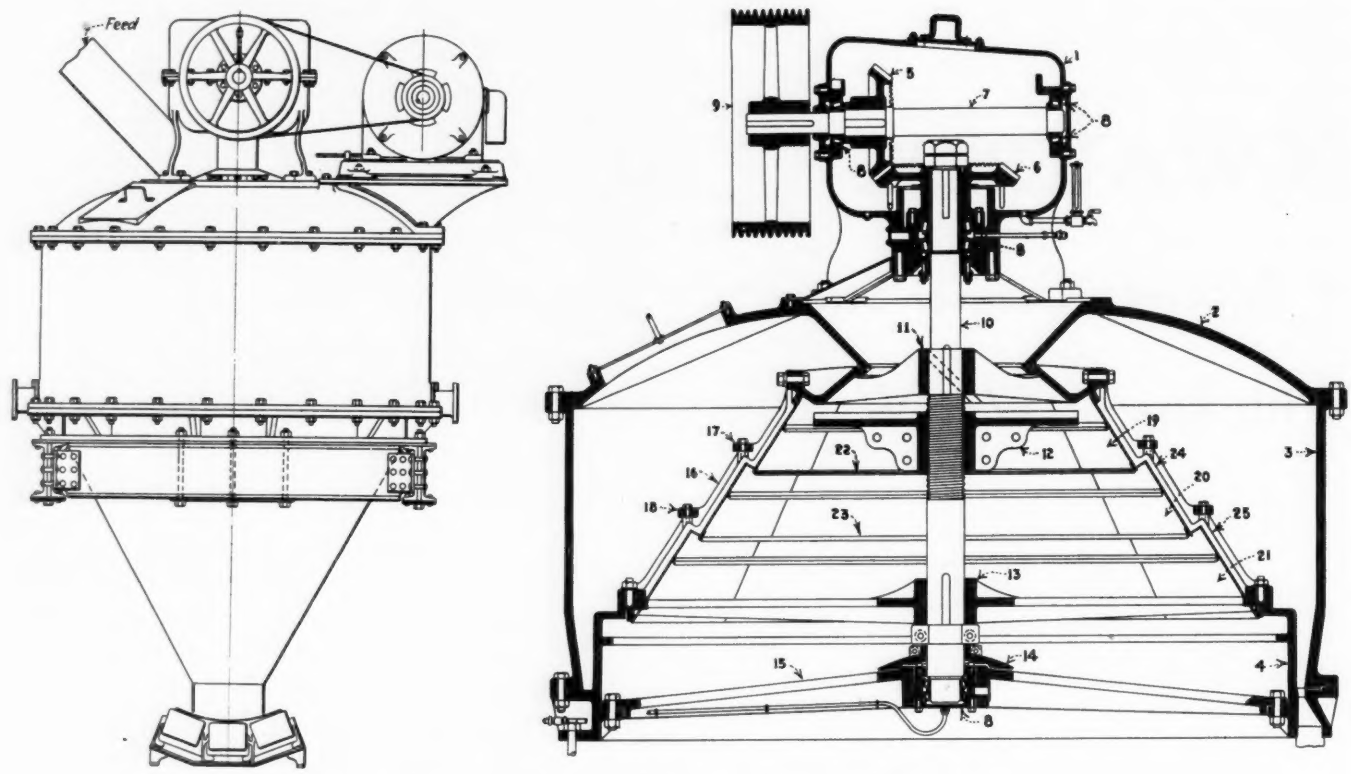


Fig. 1—Left, assembly view of Carpenter dryer; right, cross-section

Parts indicated by numbers in the cross-section are: 1, gear casing; 2, top cover plate and feed hopper; 3, dryer casing; 4, base; 5, pinion; 6, gear; 7, drive shaft; 8, bearings; 9, Texrope sheave; 10, main shaft; 11, upper dryer rib support; 12, distributing disk; 13, lower dryer rib support; 14, bearing apron; 15, bottom bearing support; 16, dryer ribs; 17, upper reinforcing ring; 18, lower reinforcing ring; 19, first row screen plates; 20, second row screen plates; 21, third row screen plates; 22, upper impact plates; 23, lower impact plates; 24, upper anchor ring segments; 25, lower anchor ring segments.

in this interval. Wedgewire for coals over 1 in. in size has $\frac{3}{16}$-in. spaces and that for $\frac{3}{8}$x0-in. coal has $\frac{1}{8}$-in. spaces. (See Table I for data on dewatering in conveyors.)

Dewatering of the minus $\frac{3}{8}$-in. fine coal is treated separately from the sludge or Dorr thickener settlings. The minus $\frac{3}{8}$-in. coal is partially dewatered on screens of the flexible hanger type, equipped with $\frac{1}{2}$-mm. phosphor-bronze wedgewire, or in dewatering elevators running 60 f.p.m. The dewatering buckets are perforated with $\frac{1}{4}$x$1\frac{1}{2}$-in. slots. From the dewatering screens or elevators the coal passes to a distributing conveyor with $\frac{1}{2}$-mm. phosphor-bronze wedgewire screens with spacings similar to the coarse coal band conveyors (Table I). Coal from the distributing conveyor passes to the feed hopper of the centrifugal dryers, through spouts set on a 42-deg. slope.

Moisture reduction on the dewatering screens, elevators, distributing conveyors and centrifugal dryers depends on the time element and size of the minus $\frac{3}{8}$-in. coal, especially the quantity of minus 48-mesh material. Table II shows results of moisture and size tests on the various dewatering units.

The Pittsburgh Coal Co. has ten Type AR-1 and three Type AR-12 Carpenter centrifugal dryers for dewatering fine coal at its three Champion plants. The AR-1 dryers are used to reduce the moisture content for shipment in open railroad cars and prevent freezing and facilitate unloading at destination. AR-12 dryers are used to reduce the moisture partially prior to heat drying[1] and also for railroad shipment. The AR-4 type dryers, for which data are included in Table II, are operating on Pittsburgh seam coal used for metallurgical purposes and similar to coals treated by the AR-1 dryers.

The Carpenter dryer (Fig. 1) consists principally of a screen basket, in the form of a stepped truncated cone, suspended on a vertical shaft with its smaller diameter at the top. The basket is rotated through spiral bevel gears by

[1] "Heat Drying of Washed Coal," by S. M. Parmley, T.P. 376, American Institute of Mining and Metallurgical Engineers.

Table I—Drainage Conveyor Data and Moisture in Discharged Product

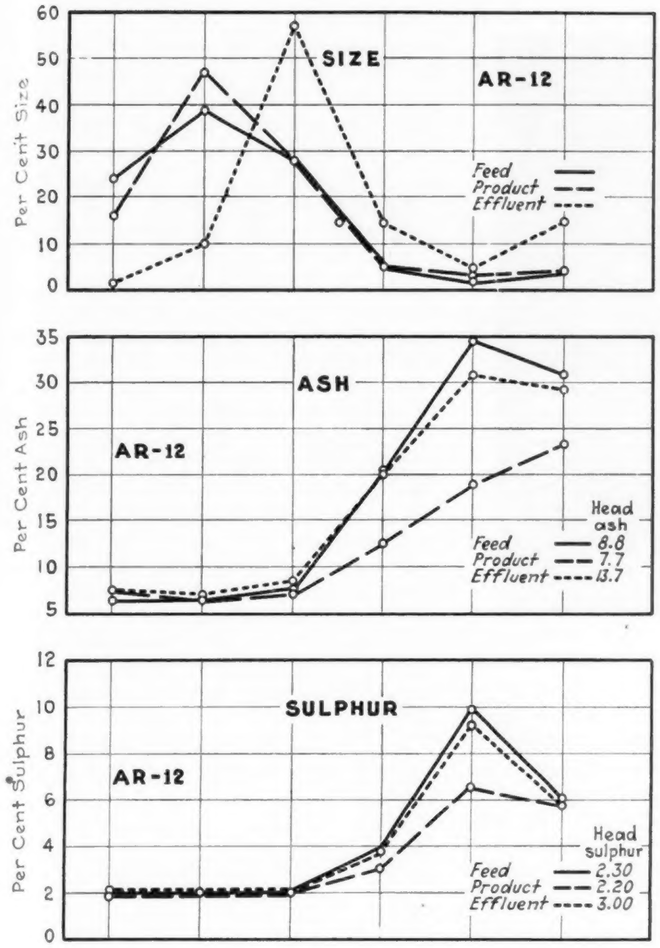
	Capacity Conv., T.P.H.	Size Flight, Inches	Length Dewatering Section, Feet	Speed of Conv., F.P.M.	Wedge wire: No. Pcs.	Wedge wire: Width & Length, Inches	Wedge wire: Size Opening	Wedge wire: Area, Sq.Ft.	Per Cent Moisture as Loaded in R.R. Cars
Washed coal, $\frac{3}{8}$x4 in....	275	7 x45	164	47	19	48x36	$\frac{1}{2}$ mm.	120	3.0
Washed coal, 2x4 in....	250	$2\frac{1}{2}$x32	54	100	5	34x36	$\frac{3}{16}$ in.	42	2.3 to 1.5
Washed coal, 1x2 in....	129	$2\frac{1}{2}$x32	68	100	6	34x36	$\frac{3}{16}$ in.	59.5	3.1
Washed coal, $\frac{3}{8}$x1 in....	125	6 x32	80	90	5	34x36	$\frac{1}{8}$ in.	42	4.5
Washed coal, $\frac{3}{8}$x1 in....	69	6 x32	150	49	9	33x36	$\frac{1}{2}$ mm.	74	3.8

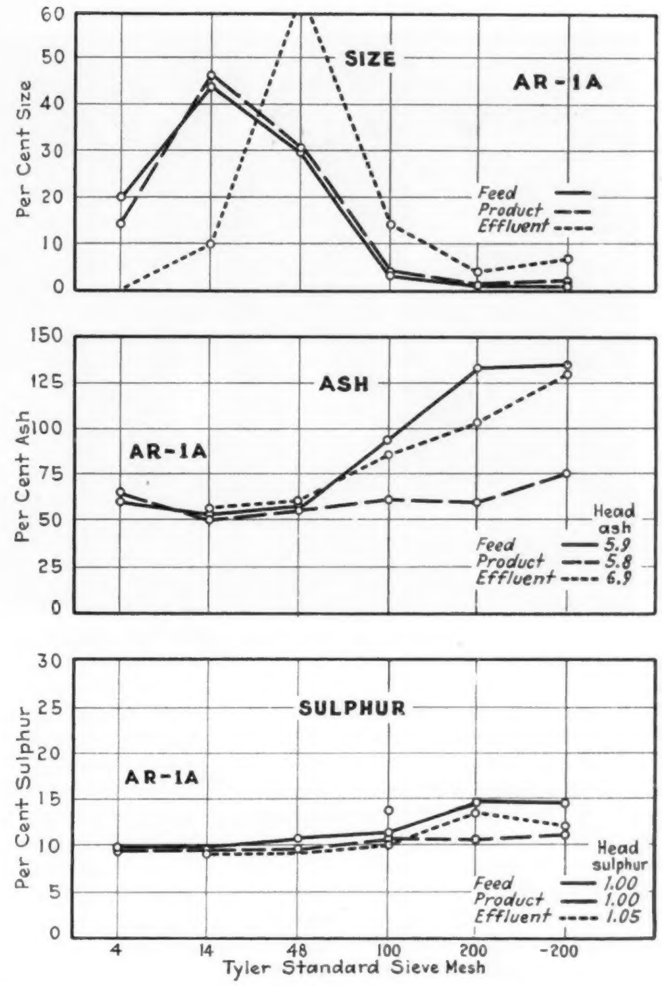
Sizes are round hole; all conveyors are drag-flight type.

Table II—Moisture Reduction and Size Relation of Minus $\frac{3}{8}$-In. Coal

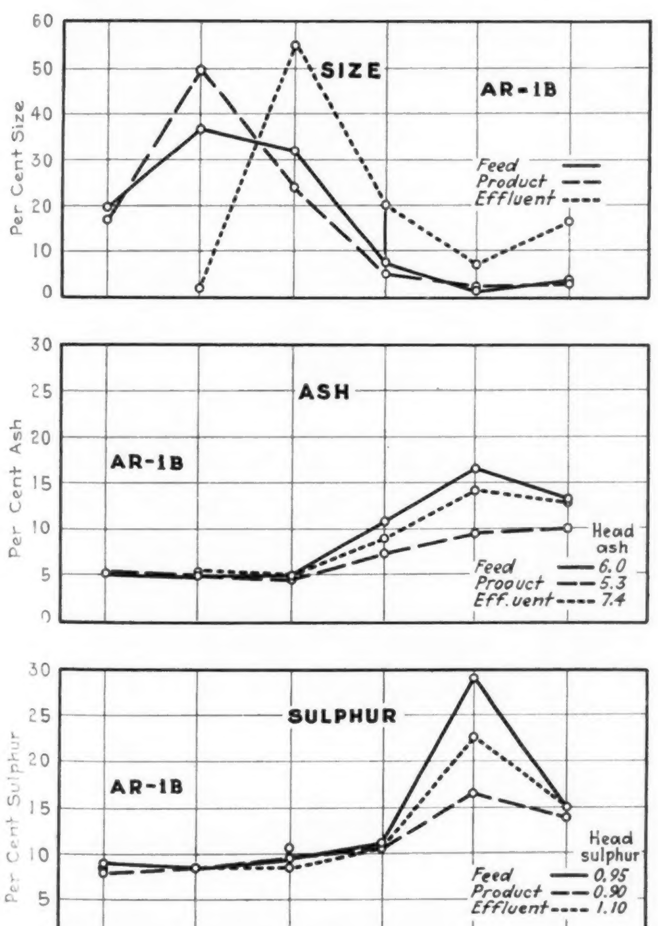
Item	Moisture in Feed, Per Cent	Moisture in Discharge, Per Cent	Size Ratio in Feed*: 4#	10#	14#	48#	100#	—100#	—48#
1. Dewatering elevator[1]......	75.0	26.0	24.0	....	38.5	28.0	4.5	5.0	.....
2. Dewatering screen[2]........	75.0	18.0	18.0	....	42.5	31.0	5.5	3.0	.....
3. Carpenter dryers, AR-12...	22.5[3]	6.5	24.0	....	38.5	28.0	4.5	5.0	.....
4. Carpenter dryers, AR-1A...	23.3[3]	5.2	20.0	....	44.5	30.0	3.5	2.0	.....
5. Carpenter dryers, AR-1B[4]...	19.0	9.1	19.5	....	36.5	31.5	7.5	5.0	.....
6. CarpenterDryers, AR-4[5]...	29.2	7.2	....	69.3	8.7	29.0	...	...	2.0

*Tyler standard screen sieves, sizes in mesh.
[1]Elevator discharges onto distributing conveyor which feeds AR-12 dryers.
[2]Dewatering screen discharges onto distributing conveyor which feeds AR-1 dryer, Item 4.
[3]After passing over 9 ft. of $\frac{1}{2}$-mm. wedgewire in distributing conveyor.
[4]Receives feed from dewatering elevator and storage bin.
[5]The AR-4 type—operating on Pittsburgh seam other than Pittsburgh Coal Co. and handling minus $\frac{3}{16}$-in. coal.



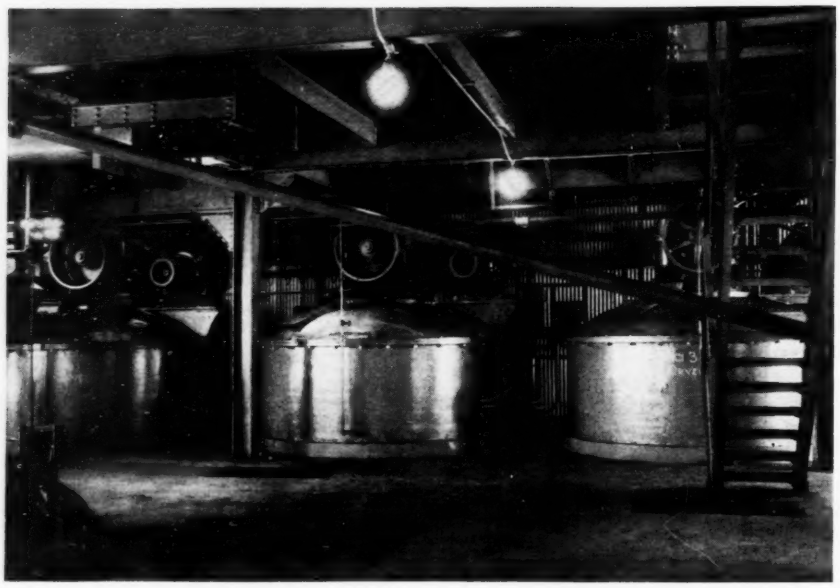


Figs. 2, 3 and 4—Size characteristics of feed, dried product and effluent, and effect of centrifugal drying with AR-12, AR-1A and AR-1B dryers



a V-belt drive to a motor mounted on a base built in conjunction with the cast-iron housing enclosing the basket, or rotor. Wet coal is fed continuously into a stationary hopper at the top of the rotor, from which it falls upon a horizontal revolving disk attached to the rotor shaft. The rotation of this disk throws the coal by centrifugal force upon the first, or top, row of screens attached to the basket, the opening between disk and screens being varied to adjust capacity or to insure a uniform flow. On this first screen row, part of the water is extracted from the coal, passing through the screens into the effluent chamber and thence out of the dryer by openings at the bottom. The partially dried coal travels to the bottom of the screens, over a lip, and is redistributed to the second screen row, where more water is extracted in a repetition of the behavior on the first row. After passing over a succession of screen rows (usually three or four) the coal is gathered from the discharge lip of the last row in a steel hopper under the dryer, from which it may go to bins or to suitable conveyor.

Extraction of water by the dryer depends upon both centrifugal force and impact. The impact of the coal-water



Battery of three Type AR-12 centrifugal dryers

mass upon the successive screen rows breaks the surface tension between solids and liquid and allows a separation due to centrifugal force, the coal acquiring velocity downward along the basket and the water passing through. The mass is prevented from packing by passing the stream from each screen over an angle lip which impinges individual particles upon the succeeding screen and thereby prevents any accumulating action of the moisture in the mass. Such action would retard the outflow of water and result in high moisture in the discharged product. The increase of centrifugal and impact forces as the coal moves downward gives the greatest impact forces where needed; that is, on the nearly dried coal.

The lip-angles, or "bed-angles," retain a wedge-shaped layer of coal on each screen, which, although not thick enough to prevent passage of water, acts as a filter in hindering the passage of fine coal through the screens and prevents an excess of screen wear due to impact. Mechanical data for the dryers are given in Table III. Despite the high speeds, the machine shows a remarkable absence of vibration, due to the even distribution and small quantity of coal in the basket at any time.

Table IV and Figs. 2, 3 and 4 show the size characteristics of the feed, dried product and effluent, and the effect of centrifugal drying on the resultant products. Data for the AR-4 dryer were taken on different screen sizes, but are shown in the table for comparison. Two sets of data are given in the tables for two AR-1 dryers of identical construction marked AR-1A and AR-1B. The dryers have different feed characteristics and the data are given to show the effect on products using feeds varying in the quantity of the minus 48-mesh material. The AR-1B has a high percentage of minus 48-mesh in the feed and is used to reduce the moisture in the coal prior to heat drying. The moisture in the product from the AR-1B dryer is higher than the AR-1A dryer with a feed containing less minus 48-mesh material.

Although the characteristics of the feed to the dryers are peculiar to each plant, the choice of the type of dryer adopted in each case depended upon capacity and available floor space rather than analysis of feed. The machine should be fed uniformly to prevent a pulsating load on the motor (amounting to a variation as high as 25 per cent of average load), due to an intermittent feed from a flight conveyor. For this purpose a feeder which maintains a continuous flow, such as a star, pan, or belt feeder, is preferable. The dryers were installed with 16-in. screw conveyors at the feed end, but the prohibitive cost of their operation made necessary a replacement by 42-deg. sloping spouts direct from the distributing conveyor.

Experiment has shown that an increased percentage of minus 48-mesh material in the feed coal decreases the possible moisture reduction in the dryer, as well as reducing the capacity. In all cases it was found advisable to reduce the feed moisture to a minimum, as such a moisture reduction resulted in a drier product.

Table III—Mechanical Data for Carpenter Dryers

	Type: AR-1A AR-1B	AR-4	AR-12
No. dryers in operation	8 AR-1A, 2 AR-1B	......	3
Diameter rotor bottom at tip	6 ft. 6 in.	7 ft. 3 in.	10 ft. 4 in.
Dimensions base (square)	8 ft. 6 in.	8 ft. 11 in.	12 ft. 8 in.
Over-all height	7 ft. 8 in.	7 ft. 11 in.	10 ft.
Speed, countershaft, r.p.m.	475	439	434
Speed, rotor, r.p.m.	370	341	267
Peripheral speed, tip of rotor, f.p.m.	7,550	7,760	8,750
Centrifugal force, lb. per lb. of load at rotor tip	158	140	126
Rim tension, lb. per lb. of load at rotor tip	24	23	20
Horsepower, empty	12	11	37
full load	22.5	39	78
Capacity, tons per hour, dry product	19.7, AR-1A; 20.0, AR-1B	27.9	52
Hp. per ton, dry product	1.14	1.39	1.50
Sq.ft. screen surface	35	46	82
Pitch, screen surface to horizontal, deg.	50	57	50
Weight, lb.	18,000*	22,000*	39,000*
Size motor (1,200 r.p.m.), hp.	40	50	75
Type motor	Horiz. slip ring	Induction	Horiz. slip ring
Gear ratio, rotor to countershaft	1:1.285	1:1.290	1:1.625
Gears	Spiral bevel	Spiral bevel	Spiral bevel
Drive	V-Belt	V-Belt	V-Belt

*Not including hopper under dryer.

Table IV—Comparison of Size Characteristics of Carpenter Dryer Products

Size Mesh*	AR-1A Dryer Feed, Per Cent	AR-1A Dryer Product, Per Cent	AR-1A Dryer Effluent, Per Cent	AR-1B Dryer Feed, Per Cent	AR-1B Dryer Product, Per Cent	AR-1B Dryer Effluent, Per Cent	AR-12 Dryer Feed, Per Cent	AR-12 Dryer Product, Per Cent	AR-12 Dryer Effluent, Per Cent	AR-4 Dryer Feed, Per Cent	AR-4 Dryer Product, Per Cent	AR-4 Dryer Effluent, Per Cent
$\frac{3}{4}$-in. x 4-mesh	20.0	14.5	....	19.5	17.0	....	24.0	16.0	1.5	....	....	....
$\frac{5}{16}$-in. x 10-mesh	....	....	....	....	....	....	....	....	....	69.3	65.1	4.7
On 14	44.5	47.0	10.0	36.5	49.5	2.0	38.5	46.5	10.0	8.7	9.6	11.5
On 28	....	....	....	....	....	....	....	....	....	15.1	15.4	44.5
On 48	30.0	31.0	64.5	31.5	23.5	54.5	28.0	27.5	56.5	4.9	5.2	22.1
On —48	....	....	....	....	....	....	....	....	....	2.0	4.7	17.2
On 100	3.5	4.0	14.5	7.5	5.0	20.0	4.5	4.5	14.0	....	....	....
On 200	1.0	1.5	4.0	1.5	2.0	7.0	1.5	2.0	4.0	....	....	..
On —200	1.0	2.0	7.0	3.5	3.0	16.5	3.5	3.5	14.0	....	....	....
Per cent moisture	23.3	5.2	64.3	19.0	9.1	74.9	22.6	6.5	50.4	20.2	7.2	70.4
Per cent of feed	100.0	85.9	14.1	100.0	95.2	4.8	100.0	76.5	23.5	100.0	93.0	7.0
Size hole in screens	One-third $\frac{1}{8}$-in. Two-thirds $\frac{1}{16}$-in.			One-half $\frac{1}{16}$-in. One-half $\frac{3}{32}$-in.			All $\frac{1}{8}$-in.			All $\frac{1}{8}$-in.		

*Tyler standard screen sieve.

BIT LIFE INCREASED

+ By Use of Hard-Surfacing on Points At St. Ellen Mine

By WALTER BAUM
Master Mechanic
Perry Coal Co.
O'Fallon, Ill.

THE USE of hard-surfacing material on cutting-machine bits rightfully deserves a place among the outstanding advances made in coal mining in recent years. This statement is based on experience at the St. Ellen mine of the Perry Coal Co., O'Fallon, Ill., where 372,948 tons of coal was produced in 1934 with 14,778 bits (new and retipped) hard-surfaced with tungsten carbide.

St. Ellen is a shaft mine in the Illinois No. 6 seam, averaging 96 in. in thickness. The coal is undercut with shortwall mining machines. Exceptionally difficult cutting conditions prevail, the bottom of the seam where the undercut is made consisting of a very hard streak of coal laminated with sulphur, commonly called "blackjack" by the miners. Water-quenched bits were originally employed and, because of the hard cutting, keeping a sufficient supply of serviceable bits available became a serious problem about four years ago.

Trial Precedes Adoption

At about this time, a hard-surfacing material was offered the writer for use on roller guides on Joy loading machines, which suggested the idea of a trial on machine bits. Fifty-five bits similar in shape to the water-quenched bits then in use were tipped with the material and sent out to one of the undercutters. These bits were run until dull, in the opinion of the operators, and were then returned for grinding. This process was repeated until the entire deposit of hard-surfacing material was worn away, in which time the 55 bits cut twenty places 30 to 40 ft. wide.

As a result of this test, the hard-surfacing material was adopted for all bits, but in six or seven months' time bit shortage again became a problem, which was complicated by the fact that labor requirements were as much as for water-quenched bits, to which had to be added the cost of the hard-surfacing material. Investigation led to the conclusion that a number of things were wrong with the bit system, and that if hard-surfaced bits were to be used (*a*) a new method of getting bits into and out of the mine without loss would have to be adopted; (*b*) the shape of the bit would have to be changed to reduce the amount of grinding required for resharpening; and (*c*) an improved type of hard-surfacing material would have to be found.

The question of bit loss was solved by the development of a bit bucket with lid (p. 426 of this issue) strong enough to withstand rough handling without losing bits. The first of these buckets still is in use. Samples of the various hard-surfacing rods on the market were then obtained and tests made to determine

Fig. 1—Two views of the welding jig employed by the author in applying hard-surfacing material

their suitability to St. Ellen conditions. These tests resulted in the adoption of tungsten carbide. The shape of the bit was then changed from that shown by Bit No. 1 (Fig. 2) to that characterizing No. 5, which has proved very satisfactory. Grinding equipment was the object of the next move. A stand carrying two $2\frac{1}{2}$x16-in. wheels, only one of which is used for bit grinding, was obtained. Wheel grade and grain were selected with an eye to suitability for removing the soft metal back of the hard-surfacing deposit. The grinding unit, including motor and supports for the shaft that drives the grinder and fan for exhausting dust to the outside of the building (an important adjunct to the unit), was mounted on a concrete base. Later, the grinding unit and base were moved down into the mine and installed close to the face so that the bit grinder can also keep a close check on bit distribution and thus prevent inequalities in the supply to the several machines.

Bits Cut 25.2 Tons Each

Grinding time is approximately $1\frac{1}{2}$ hours per day. When the hard-surfacing deposit is worn away, the bits are sent out to the writer for reforging and retipping. As noted above, 1934 bit requirements totalled 14,778 for 372,948 tons, or 25.2 tons per bit. Table I gives production and number of bits used by months. Of the bit total, 3,500 at $2\frac{1}{2}$c. each were new. Purchases of tungsten carbide totalled 40 lb. at $5 per pound. Not all of this was used, as the consumption runs approximately 10 lb. per 4,000 bits. Reforging and retipping required 100 hours of labor, of which 50 hours went to cleaning the tips of the bits and applying the hard-surfacing material.

In applying the hard-surfacing material, the jig shown in Fig. 1 is employed.

Table I—Bit Consumption and Production at St. Ellen Mine in 1934, by Months

	Tons Produced	Bits Used
January	38,931	561
February	30,643	1,700
March	42,635	1,712
April	21,937	785
May	20,552	1,429
June	24,120	950
July	28,663	3,064
August	32,659	None
September	30,013	1,650
October	34,201	500
November	33,002	733
December	35,592	1,594
Total	372,948	14,778

Capacity of the jig, which runs on rails and is moved by the foot, is 200 bits. Track gage is 16 in.; height, 24 in.; length, 48 in. The top is 12 in. wide, and the back ends of the bits rest on $\frac{3}{4}$-in. risers along each side. Bits are placed as close together as possible with the points toward the center of the jig. When welding starts on the tips, the gases from the flame come up between the bits and consequently act as a preheater; also, the gases keep treated bits from cooling too quickly. Very few bits treated in this manner have broken.

Dealing specifically with various shapes of bits (Fig. 2), Bit No. 1 is the water-quenched type used at another of the company's mines. No. 2 is the same type bit after one use. No. 3, used only once, shows the results of slipping under the setscrew. No. 4 is a bit as purchased. No. 5 is the same bit changed in shape for hard-surfacing, which appears on No. 6. Bit No. 7 has been used three times and still retains considerable of the hard-surfacing material. This bit, without regrinding, will cut glass. Nos. 8 and 9 have been used six and seven times before the hard-surfacing was worn away (note setscrew marks).

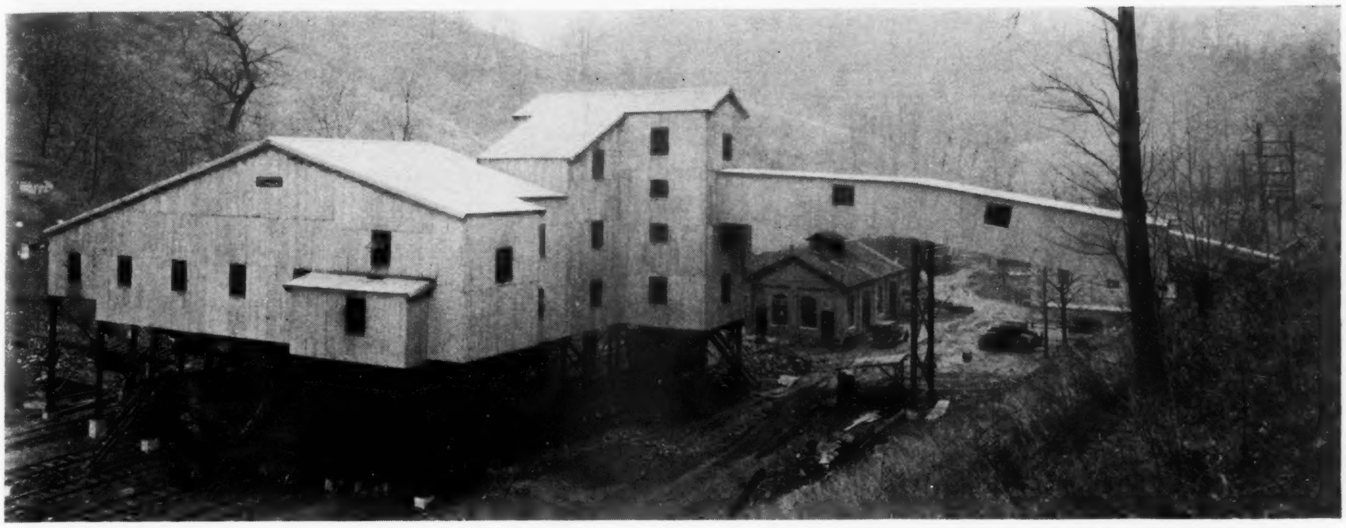
Bit No. 10 shows the results of poor grinding. If the rest of the grinds were to be made in the same manner the heel soon would be above the point, with considerable friction as the result. No. 5 illustrates the proper grinding method. No. 11 takes first place as a bad example of bit treatment. A substantial number of bits are turned out in his fashion—i.e., with shanks spread too much. This excessive spread prevents the bit from going down into the bit block, with the result that it extends out so that the point rubs on the frame and is dulled immediately before it enters the coal. No. 12 shows how one blow of the hammer will correct this defect. No. 13 is a bit as it comes from the forging operation. The fins are easily broken off by dipping the point in cold water and tapping it. The tongs are designed for holding the bits during regrinding—an important factor in securing proper results.

Power Cut by New Bits

A recent test demonstrated that hard-surfacing materially reduces the current demand in cutting. With water-quenched bits that had run only a short time, a peak of 400 amp. was registered when very hard cutting was encountered. On the other hand, tungsten-carbide-tipped bits pulled only 175 amp. while in hard cutting and only 125 amp. after moving on into softer material. No reading of over 175 amp. was registered with hard-surfaced bits. The machines are rated at 200 amp.

Since the adoption of hard-surfaced bits, the seven shortwall cutters at St. Ellen have suffered no breakdowns while cutting, although some have occurred while moving. Each machine is overhauled once a year, which means that there is little replacement of parts in the intervals between.

Fig. 2—These thirteen bits afford a graphic comparison of the characteristics of the various types



This new plant now handles the entire production of the Miller's Creek Division

NEW VAN LEAR PLANT

+ Centralizes Preparation for Mines In "Consol's" Miller's Creek Division

By J. H. EDWARDS
Associate Editor, Coal Age

PROVISIONS for crushing lump and furnace sizes from the Miller's Creek seam, which is noted for its blocky premium domestic lump, is one of several features of the new tipple put into use early this year by the Consolidation Coal Co. at Van Lear, Johnson County, Kentucky. The new plant, which included installation of modern bottom equipment and a slope conveyor, concentrated at Mine No. 155 the entire production of the Miller's Creek division. Special design was necessary because of the hard structure of the coal and the extremely large lumps that may reach the tipple.

Ratings of the plant are 600 tons per hour normally (650 tons maximum) and 400 tons per hour when crushing. Slack is deposited in the railway cars by a loading boom instead of a chute, and on its way to the boom the slack passes over a magnetic pulley with electrical controls arranged so that the pulley must be energized before the tipple drive motors can be started. Practically all of the shafts of the tipple and bottom equipment are fitted with roller bearings and a floating drive is used for the shaker screens. Construction is concrete and steel, and car retarders are mounted free of the tipple as a precaution against damage to the structure in case railway cars should break loose and hit a car which is attached to a retarder.

★ ★

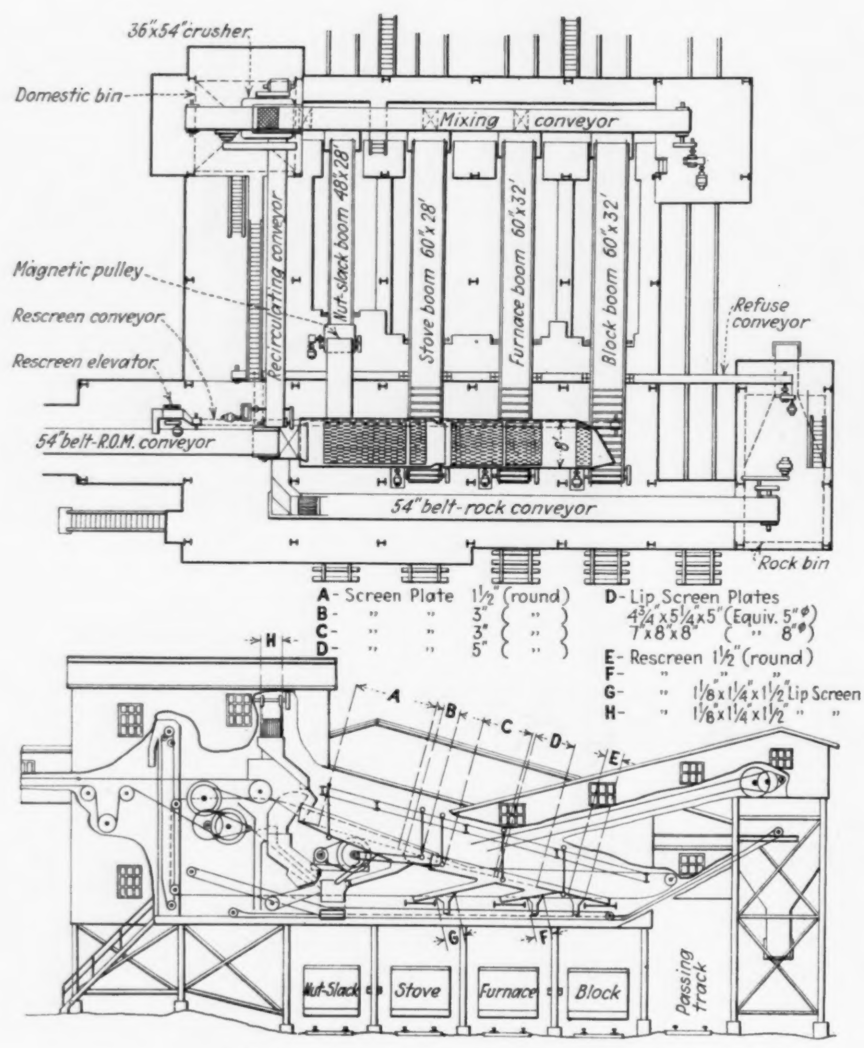
Who Says "Backward"?

Specifications for the new Van Lear tipple read almost like the prospectus of the latest in automobiles. Floating power, elimination of vibration, and modern electrical and mechanical refinements to insure continuous and efficient operation have been incorporated in this new central cleaning plant. With these improvements is a simplification in design which gives an appearance of greater roominess and of less, instead of more, machinery. Lubrication will be the principal maintenance item and here the general use of anti-friction bearings will reduce that cost to a fraction of what it would have been for a tipple designed a few years ago.

★

On the slope a 54-in. belt 661 ft. 6 in. between centers, performing a lift of 145 ft., equipped with gravity take-up near the head end, and operating at 250 ft. per minute, replaced an endless rope haul 580 ft. long on an adverse grade of 25 per cent. Specifications of the belt, which handles both run-of-mine coal and rock, are: 8-ply, 42-oz. duck, $\frac{3}{16}$-in. top cover and $\frac{1}{16}$-in. pulley cover. Heavy-duty three-pulley troughing idlers equipped with roller bearings are spaced on 48-in. centers and the return idlers on 10-ft. centers. For the most part the main belt conveys up a pitch of 14 deg. 2 min. A short section at the upper end is horizontal and at the lower end a short section is on 18 deg.

Sixty-inch tandem-drive pulleys (head pulley is 54 in. in diameter) are connected to a 150-hp. 720-r.p.m. motor through V-belt and spur-gear reduction. On the countershaft is a silent safety pawl holdback, and driven from the headshaft is a revolving rubber-brush belt cleaner. The discharge chute at the bottom of the slope contains a short section of bar screen designed to drop the fines onto the belt as a bed for the



Indicating general arrangement of equipment

large, sharp-edged lumps from the mine.

Other bottom equipment newly installed includes a booster feeder, trip feeder, trip maker, cross-over dump fitted with double-acting trunnioned air cylinder for emergency operation, 7½-ton dump hopper and an apron feeder. The four motors of this bottom equipment total 90 connected horsepower and each is connected through a herringbone gear reducer. The trip maker, which has 35-ft. centers, receives empty cars from the kick-back, elevates them to the height of the empty track and advances the empty trip until its full length is made up.

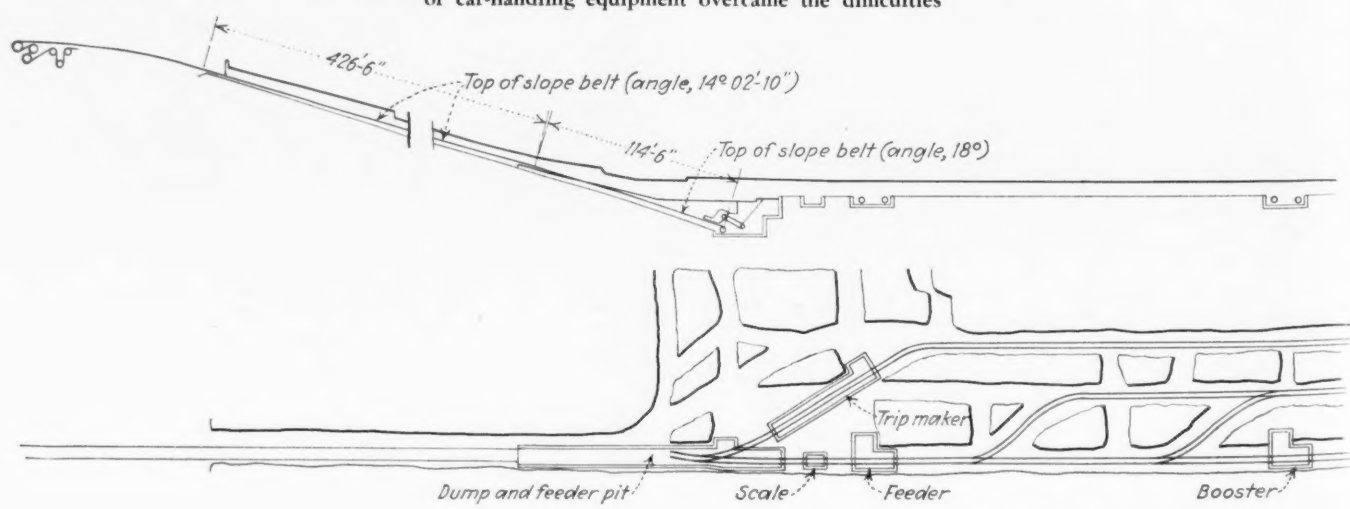
All screening in the tipple is done by the main shaker, which is 8 ft. wide, has an inclination of 15 deg., and is divided into two balanced sections. Lump, furnace, egg and slack are the primary sizes made and the first three are rescreened before passing onto the loading boom. Crankshaft, V-belt drive and 30-hp. motor are mounted on a floating frame which is supported on short hangers from the rigid part of the tipple structure. Effective shielding of structure from shock and vibration by a drive of this type installed at the company's Monongah mine (*Coal Age*, July, 1934, p. 277) was responsible for its selection for the Van Lear plant.

Picking-table and loading-boom units for the three sizes, lump, furnace and egg, are identical. Each is an apron conveyor 60 in. wide with a 23-ft. horizontal section and a 32-ft. hinged section. Speed is 70 ft. per minute and drives are 10-hp. motors connected through worm reducers. To minimize degradation in the transfer from screen noses to loading booms a patented arrangement is used whereby a short section of the boom conveyor is set on a pitch, making it unnecessary to deform the discharge noses.

Specifications of the apron-conveyor boom which loads the slack are: width, 48 in.; horizontal section, 6 ft.; hinged section, 32 ft.; and speed, 75 ft. per minute. The motor and worm gear are identical with those of the other three booms. Chains of the booms and of other link and roller conveyors are lubricated automatically by individual piston-type oilers.

Lump and furnace sizes when destined for crushing are carried from the ends of the boom (with hinged sections raised) to the crusher on the top strand of a 48-in. flight conveyor 100 ft. long between centers. The lower strand of this same conveyor serves to mix the screenings, and, by reversing the travel, coal is carried on the lower strand to the domestic bin. A 25-hp. 1,200-r.p.m.

Because of adverse grades, the bottom layout was not ideal, but installation of car-handling equipment overcame the difficulties



motor working through a herringbone reducer drives the conveyor at 100 ft. per minute.

Equipment for crushing 250 tons per hour of plus-3-in. coal to 2½ in. consists of one 36x54-in. single-roll unit equipped with manganese segments, "Steelstrut" toggle and a quick adjustment feature. Its drive is a 150-hp. motor connected by V-belt. The hopper above the crusher is designed to handle lumps which may have dimensions as great as 2½ ft. each way, and in service the equipment has handled lumps with one-way dimensions as great as 44 in.

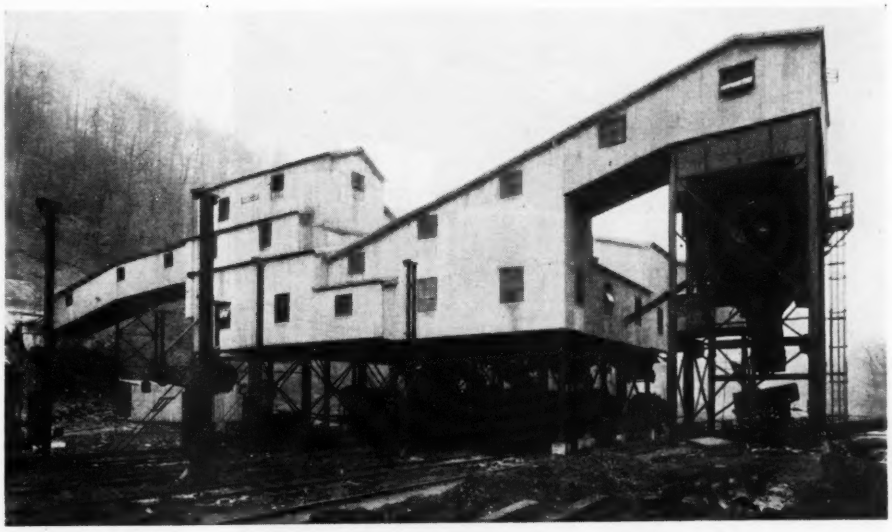
Delivery of the crushed coal to the shaker screens for resizing is effected by a recirculating conveyor of the flight type, 36 in. wide, 66 ft. long between centers and operating at 100 ft. per minute. A bar screen in the chute where this conveyor delivers to the shakers bypasses the fines directly to the slack, thus relieving the shakers to some degree. Two units—one a 12-in. drag chain conveyor and the other a 10x6-in. centrifugal discharge elevator —deliver the rescreenings from the lump, furnace and egg rescreens to the upper end of the shaker screens.

Slack coal is transferred from the shakers to the loading boom by a belt conveyor 54 in. wide and 19 ft. long (center distance). The head pulley of this conveyor contains the magnet which removes tramp iron. Dustless treatment is effected in a boxed vertical chute connecting the conveyor discharge with the horizontal section of the boom.

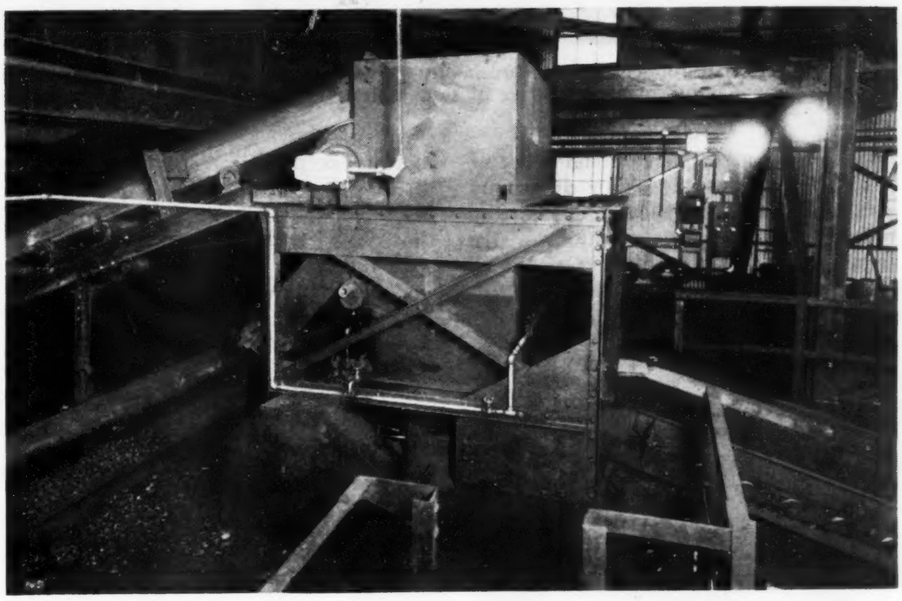
Mine Rock Is Bypassed

Mine rock, which is brought up the main slope on the belt conveyor, is bypassed through an air-operated valve in the stationary rubber-lined chute leading to the main shakers, is carried from the bypass on a second belt conveyor to a 100-ton steel bin built separate from the tipple and on the opposite side of the passing track. This latter conveyor is 54 in. wide, 85 ft. long (between centers), operates at 250 ft. per minute and has a capacity of 600 tons per hour. Belt specifications are: 8-ply 32-oz. duck, $\frac{3}{16}$-in. top cover and $\frac{1}{16}$-in. pulley cover. Transportation from the bin to the hilltop disposal is effected by a self-dumping car and single-rope hoist. Undercut gates of the rock bin and of a 35-ton domestic coal bin are air operated and are fitted with self-locking links. These gates, which are the curved-plate type, are 4 ft. wide by 3 ft. deep and are duplicates.

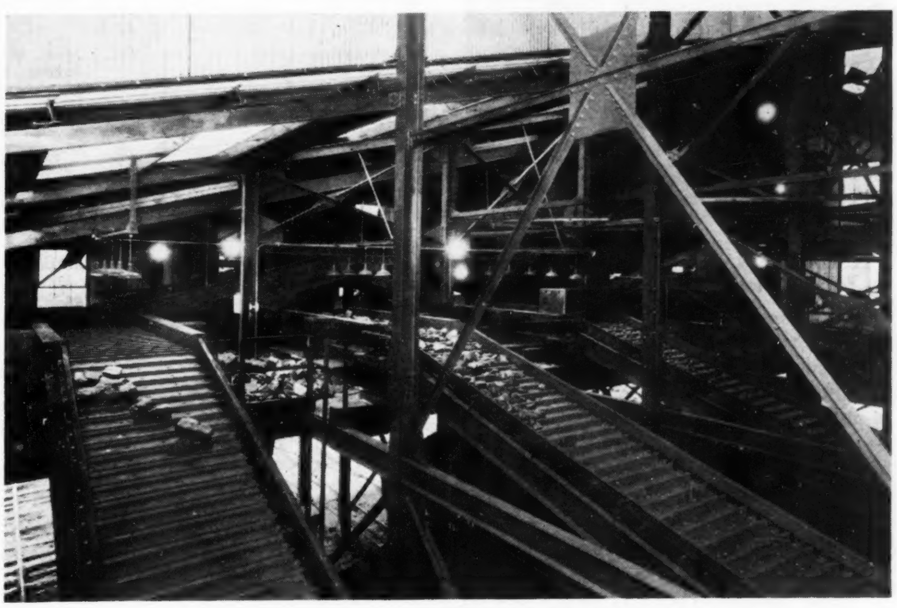
Masts of the four car retarders are positioned between tracks on the empty side of the tipple. Guys attached just above the retarder mounting impart the necessary strength to withstand rope pull. Counterweight travel paths are guarded at the bottom ends by steel boxes. The mast-mounting arrangement frees the tipple structure from



Looking down the track at the new plant. Car retarders and masts appear at left and the 100-ton rock bin at right

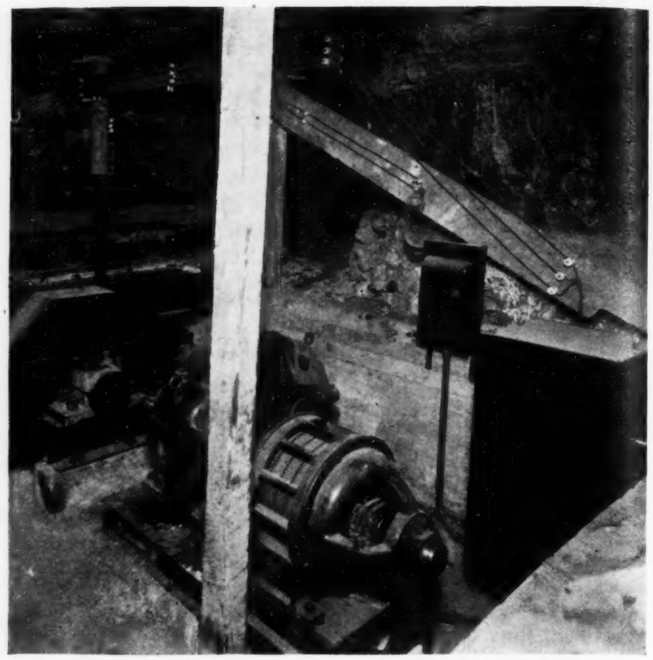


Magnetic head pulley and, below it, the dustless treating equipment for treating 1½-in. slack as it is fed onto the boom



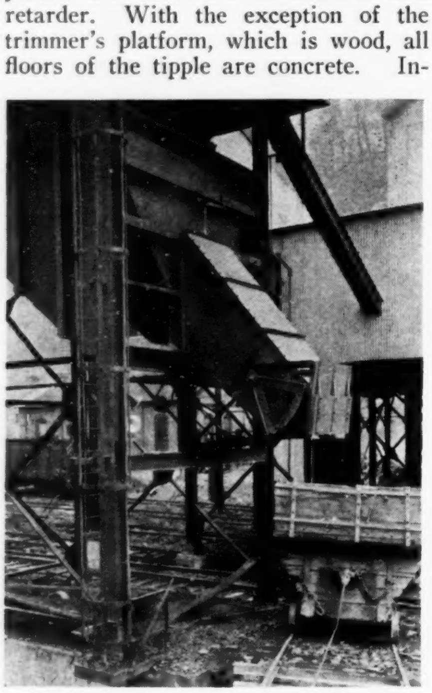
Special lighting is installed above the picking tables

Head pulley, left; rubber cleaning brush, lower center; and upper pulley of tandem drive of slope belt



Trip feeder drive at bottom of slope at Van Lear preparation plant in Miller's Creek field of Kentucky

possible serious damage should a car or several cars break loose in the empty yard and crash into a car attached to a retarder. With the exception of the trimmer's platform, which is wood, all floors of the tipple are concrete. Interior stairs are inverted channels filled with concrete, and outside stairs have treads of steel grating. Siding and roofing of the building are corrugated galvanized steel (not less than 2 oz. per square foot), the former No. 24 gage and the latter No. 22 gage.



A trunnioned air cylinder operates the curved-plate gate of the rock bin

Not counting boom hoists, the plant equipment includes seventeen motors totaling 555 connected horsepower. Four of these motors (90 hp. total) are at the slope bottom. All are 220-volt motors excepting the 150-hp. unit driving the slope belt, which is operated at 2,200 volts. Motor-control circuits of the plant are electrically interlocked with the small motor generator supplying direct current to the magnetic pulley, thus assuring magnetic picking of tramp iron from the slack at all times while the plant is in operation.

Corrugated wire-glass skylights and modern artificial lighting afford adequate illumination for every condition. Units consist of 200-watt lamps in porcelain reflectors having dust-tight covers of day-blue glass. Above each picking table is one row of five reflectors spaced on 2-ft. centers and mounted 30 in. above the surface. Shock-absorbing swivel hangers protect the lamps from structure vibration. The tipple was constructed by the Fairmont Machinery Co.

List of Plant Units and Drives

Equipment	Size	Speed, Ft. Per Minute	Hp. Motor	R.p.m. Motor	Drive
Booster feeder	8 ft. 8 11/16 in. centers	100	50	900	Gear reducer
Trip feeder	8 ft. 8 11/16 in. centers	45(coal, max.) 28(rock, min.)	15	1,750	Gear reducer and four-speed transmission
Trip maker	35 ft. centers	80	15	720	Gear reducer
Apron feeder	13 ft. centers	80(coal, max.) 50(rock, min.)	10	1,750	Gear reducer and four-speed transmission
Belt conveyor	54 in., 661 ft. 6 in. centers; lift, 145 ft.	250	150	720	V-belt and spur gears
Shaker screen	8 ft. wide	....	30	900	V-belt
Lump picking table and loading boom	60 in. wide, 23 ft. horiz., 32 ft. hinged	70	10	1,200	Worm reducer
Furnace picking table and loading boom	60 in. wide, 23 ft. horiz., 32 ft. hinged	70	10	1,200	Worm reducer
Egg picking table and loading boom	60 in. wide, 23 ft. horiz., 32 ft. hinged	70	10	1,200	Worm reducer
Slack belt conveyor	54 in. wide, 19 ft. centers	100	(driven from slack loading boom)		
Slack loading boom	48 in. wide, 6 ft. horiz., 32 ft. hinged	75	10	1,200	Worm reducer
Remixing conveyor	48 in. wide, 82 ft. centers (flight type)	100	25	1,200	Gear reducer
Crusher	36x54 in., single roll, 250 t.p.m. plus 3 in. to 2½ in.	....	150	720	V-belt
Recirculating Conveyor	36 in. wide, 66 ft. centers (flight type)	100	5	1,200	Gear reducer
Rescreen conveyor	12 in. wide, 60 ft. centers (flight type)	100	5	900	Gear reducer
Rescreen elevator	10x6 in., 30 ft. centers	....	5	900	V-belt
Rock belt conveyor	54 in. wide, 85 ft. centers	250	35	900	V-belt and spur gears
Refuse conveyor	12 in. wide, 100 ft. centers (chain drag type)	100	5	1,200	Gear reducer

[LAST OF THREE ARTICLES ON GATHERING SERVICE

BATTERY COSTS

+ Over Long Periods of Use

Determined by Graphic Methods

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EVALUATING all of the factors in determining the type of battery which would result in the lowest cost was the final problem in the general study of gathering locomotives at the Keystone mine of the Houston Collieries Co., McDowell County, West Virginia. Curves prepared to analyze the costs clearly indicate the wide variations and show the effect of the length of time that the particular type of battery is continued as the standard. Previous articles (*Coal Age*, August, 1935, p. 327, and September, p. 368) dealt with the test performances and efficiencies of cable-reel and battery locomotives at Keystone mine and set forth comparative over-all costs.

Aside from revealing which type of battery is cheapest for a given set of conditions, the three sets of curves (Figs. 1, 2 and 3) indicate that the actual cost per month will always be higher than the manufacturer's "guaranteed cost," even though freight and the labor cost of changing batteries be taken into account.

To determine the true battery cost per month it is necessary first to determine the length of time that battery equipment will be used at the mine—that is, until possible obsolescence or until the mine is worked out. Next it is necessary to determine the expected life with accuracy, and this can be done only from the basis of past experience.

Referring to Fig. 1, which deals with costs during successive renewals of a certain make of battery, the net cost per month is much higher during the first few years than the guaranteed replacement cost; this due to the gradual spreading of the cost of the first battery over the total elapsed time. The broken-line curve of true costs takes into account the vertical increase at purchase and the gradual decrease with use, of each renewal.

Points "M" and "N" indicate the effect of securing longer than expected life from the third battery (second replacement battery), and in this case the minimum-cost curve as plotted on Fig. 1 would from then on be too high. Point "M" represents 25 per cent greater life than the expected life and a resulting monthly cost 10 per cent below the minimum; and point "N," 150 per cent expected life and 14 per cent lower cost.

These points "M" and "N" indicate a cost advantage in maintaining batteries so as to prolong the life. However, a 10 per cent lower cost at "M" does not cause the minimum curve to be lowered 10 per cent throughout its entire length, because with a renewal at point "M" there is a smaller guarantee trade allowance than when the renewal was made at the point of expected failure.

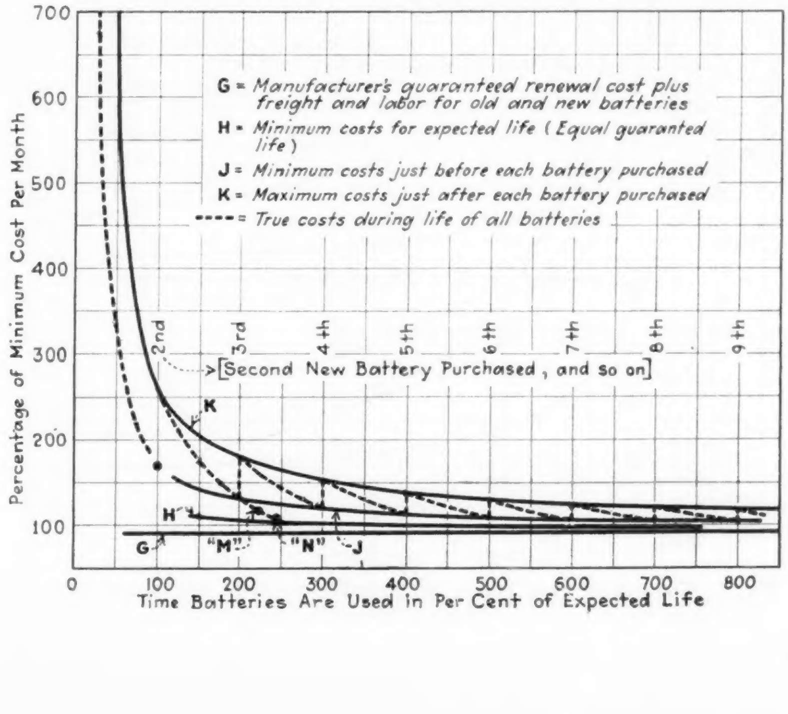
If from "N" the minimum-cost curve *J* is replotted on the expected-life basis, the saving at the next replacement period amounts to only 1 per cent. If the continuation is plotted on a 150 per cent expected-life basis, the saving at the next replacement period will be approximately 11 per cent.

The minimum-cost curve flattens when longer than original expected life is secured and indicates lower costs per month which approach curve *H*. This latter curve was plotted in the same manner as *J* except that the expected life was assumed as 50 per cent greater, thus equalling the guaranteed life of that particular make of battery.

The curves in Figs. 2 and 3 cover four well-known makes of batteries and were plotted from calculations based on quotations on new batteries to replace the 54-cell 39-plate batteries of the three makes then in use at Keystone mine.

Total costs were obtained by adding the net cost of the first new battery to the net costs of replacing subsequent batteries up to approximately twelve years' time. This total cost includes freight

Fig. 1—Analysis of possible cost variations for one type of battery



on new and old batteries for each replacement. The expected life of each make of battery was obtained by averaging the lives obtained from batteries of like make formerly used.

Cost per month was calculated by dividing the total cost for a given period by the number of months in that period, and to arrive at the total cost the following formula was derived and used:

$$\text{Cost per month} = \frac{(A+Fn+Fo+L)\ N(R+Fn+Fo+L)}{\text{Months of use}}$$

In this formula A equals the total cost of the first battery less any allowance received for the replaced battery; Fn and Fo equal freight charges on the new and old batteries respectively; L equals the labor cost of handling, disconnecting and connecting old and new batteries (estimated at $25); N equals the number of replacements; and R the cost of replacements (cost of new battery minus scrap value of old battery and minus a quantity arrived at by multiplying the guaranteed cost per month by the guaranteed life minus the expected life).

Whole numbers only are taken for N values, which are arrived at by dividing the number of months the particular make of battery has been used in the locomotive by the expected life in months. At the termination date of each expected life two N values apply, one just before replacement and the other just after replacement. The one just before replacement is obtained by subtracting "one" from the first value obtained.

Curves of Fig. 2 are based on a purchase price without allowance for scrap value nor for failure of battery life to equal the guarantee. Curves of Fig. 3 differ in that the credits are allowed and that two curves are plotted for each battery—for instance, curve *B* is for costs of a battery *B* replacing one of like make and curve *BB* is for battery *B* replacing one of some other make.

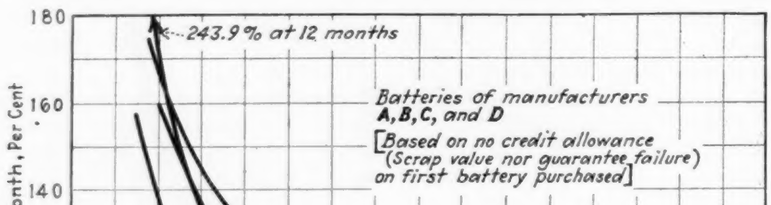


Fig. 2—Costs of four makes of batteries without scrap or guarantee credits

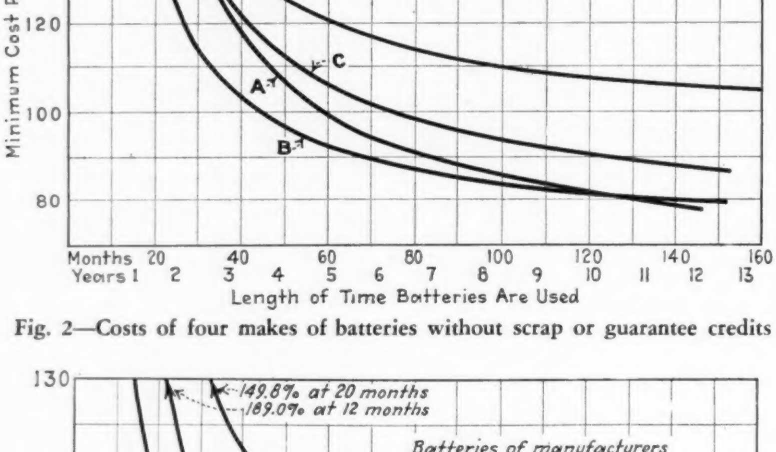


Fig. 3—Comparing four makes of batteries proposed for actual replacements at the mine

In the case of battery *D*, which is of a lower capacity than the others, two "replacing-own-make" curves are plotted because a second and lower-cost proposal was submitted. The upper curve, *D-1st*, gives truer comparative values with the curves of other makes. Costs per month were multiplied by the ratio of "ampere-hour capacity of other batteries" to "ampere-hour capacity of battery *D*."

Curve *D-2d* slopes upward because the replacement price quoted was higher than the price of the first battery. The shape of the curve shows that the cost per month would increase with increase in length of time that the particular make of battery was used in the locomotive. Both of the curves *D-1st* and *D-2d* approach as an asymptote or limit the replacement cost, but since neither one would ever reach that replacement cost, the lower proposal, *D-2d*, proves cheaper. In Fig. 3, as in Fig. 2, this battery *D* has a much higher cost than the others but is the most expensive battery after the first replacement.

Both figures show that battery *B*, due to lower first cost, delivers service at a lower cost per month than the others if it is to be continued as the standard for a time up to approximately ten years. For consecutive replacements over periods longer than that time, battery *A* would have a lower cost per month. This is because the higher first cost of battery *A* is offset gradually by the lower replacement charges. The *A* battery's advantage for longer than ten years should be discounted by the chance of any one particular type becoming obsolete in ten years. Curve *AA* crosses the *BB* curve at seven years and crosses the *B* curve at twelve years.

In the terms of the formula, when the difference between $(A+Fn+Fo+L)$ equals the difference between $N(A+Fn+Fo+L)$ for the two batteries, the curves cross. Battery *A* costs are lowered by the fact that the freight charge on the old battery is the transportation cost to the local dealer instead of that to the factory.

Because of low capacity, battery *C* has two curves on Fig. 3. These curves show that the battery might be considered for an expected battery use of five years (based on the lower curve *CC*) but it would be out of the question when based on a capacity equivalent to the others. This battery has a longer expected life than the others, which might be a feature for consideration in some special cases.

The curve *G*, Fig. 1, which is a straight line and represents the manufacturer's guaranteed cost, is the asymptote to all of the curves. Due to the purchase price of the first battery being included in the costs, this "manufacturer's guaranteed cost" is never reached. The costs represented by the curves of Fig. 2 also approach but never reach the "manufacturer's guaranteed cost."

MECHANIZATION UP

+ With Tonnage by Mobile Machines Topping All Previous Records in 1934

MECHANICAL LOADING of coal underground continued to register gains in tonnage last year, according to figures made public Sept. 14 by the U. S. Bureau of Mines. The total tonnage handled by mobile loaders, scrapers, duckbills and other self-loading types of conveyors, and by pit-car loaders and other types of hand-loaded conveyors was 50,717,221 net tons. Bituminous output so loaded—41,432,735 tons—was 3,612,274 tons, or 9.6 per cent, greater than in 1933. Due in major part to the very marked increase in tonnage with hand-loaded face conveyors, mechanically loaded anthracite in 1934 climbed to 9,284,486 tons—an increase of 2,727,219 tons, or 41.6 per cent, over the preceding year. The comparative record on bituminous coal since 1923 (the first year for which government statistics are available) is set forth in Table I; similar data on anthracite since 1927 are given in Table II.

Although the total tonnage of bituminous coal loaded mechanically in 1934 was still under the banner years of 1930 and 1931, the tonnage last year nevertheless represents more than a twenty-fold increase over the 1923 figures. Moreover, the quantity of soft coal handled by mobile loaders in operation at bituminous mines in 1934 (see Table III) tops all previous records. Compared with 1933, the tonnage credited to mobile loaders increased 2,884,459 tons, or 16.1 per cent. Tonnage handled by duckbills and other self-loading conveyors showed a gain of 25.7 per cent, but the actual tonnage increase over 1933 was only 426,231 tons.

Pit-car loaders, which made such phenomenal strides in tonnage in 1929 and 1930, suffered a further loss both in tonnage and in the number of units in operation last year. Since the sharp break in tonnage which took place in 1932, however, the recession has been at a greatly decelerated pace: last year, for example, the decline was only 2.8 per cent. Despite this loss, 26.8 per cent of the bituminous coal produced mechanically was credited to the pit-car loader. Mobile types of loading machines accounted for 50.1 per cent; other conveyors, including duckbills, 20.7 per cent; and scraper loaders, 2.4 per cent.

As has been the case since 1928, Illinois still leads all bituminous producing States in actual tonnage handled mechanically. Pennsylvania holds the sec-

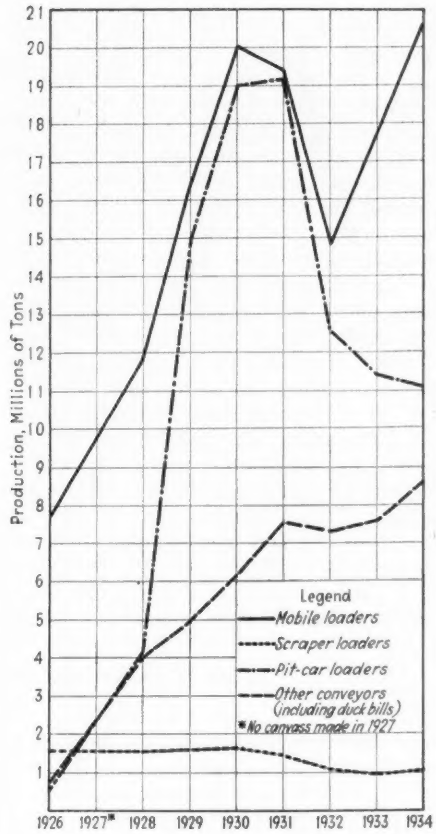


Fig. 1 — Bituminous tonnage handled by different types of loading equipment

Table I—Mechanized Loading Record for Deep-Mine Bituminous Operations: 1923-34

Year	Number of Mines*	Number of Machines	Total Tonnage Loaded Mechanically	Per Cent of Total Output (Deep Mines Only)
1923	60	125	1,879,726	0.3
1924	83	219	3,495,522	0.7
1925	95	340	6,243,104	1.2
1926	131	455	10,545,133	1.9
1927	No data		16,500,000†	3.3
1928	346	1,649‡	21,559,233	4.5
1929	412	3,234‡	37,861,496	7.4
1930	418	3,711‡	46,982,298	10.5
1931	401	4,322‡	47,562,108	13.1
1932	350	3,947‡	35,816,909	12.6
1933	283	3,201‡	37,820,461	12.0
1934	280	3,098‡	41,432,735	12.2

*These figures include partially mechanized operations.

†Bureau of Mines estimate; no canvass was made for 1927.

‡Exclusive of installations of hand-loaded conveyors, which are reported on a mine basis and not on an equipment-unit basis. For details on number of mines with such installations, see Table III.

Note: Separate data on tonnage handled by pit-car loaders were not reported prior to 1926; data on other hand-loaded conveyors were not available prior to 1928—[1]*Mineral Resources of the United States*, 1931—Part II, p. 453.

Table II—Mechanized Mining Record for Pennsylvania Anthracite: 1927-1934
(Tonnage Figures in Thousands of Net Tons)

Year	Scraper and Mobile Loaders Units	Scraper and Mobile Loaders Tonnage	Conveyors and Pit-Car Loaders Units	Conveyors and Pit-Car Loaders Tonna e	Total Units	Total Tonnage	Per Cent of Total Output (Deep Mines only)
1927	305	*	159	*	464	2,223	3.0
1928	302	*	184	*	486	2,351	3.4
1929	350	2,450	355	1,020	705	3,470	5.0
1930	384	2,927	421	1,541	805	4,468	6.9
1931	462	2,463	576	1,922	1,038	4,385	8.2
1932	490	2,652	859	2,782	1,349	5,433	12.4
1933	464	2,395	965	4,162	1,429	6,557	16.0
1934	531	3,018	1,376	6,267	1,907	9,284	19.4

*Tonnage not separately reported in 1927 and 1928.

†All percentages in this column are on the basis of total newly mined production minus tonnage recovered by stripping.

Table III—Deep-Mine Bituminous Output Loaded Mechanically by Different Types of Loading Equipment: 1926-1934

Year	Mobile Loading Machines Thousands of Tons	Mobile Per Cent Total*	Mobile Number of Units	Scraper Loaders Thousands of Tons	Scraper Per Cent Total*	Scraper Number of Units	Pit-Car Loaders Thousands of Tons	Pit-Car Per Cent Total*	Pit-Car Number of Units	Other Conveyors† Thousands of Tons	Other Per Cent Total*	Other Units	Number of Installations‡
1926	7,786	73.9	205	1,554	14.7	133	523	4.9	....	682	6.5	27	...
1927	No canvass made			No canvass made			No canvass made			No canvass made			
1928	11,811	54.8	397	1,548	7.2	130	4,117	19.1	1,040	4,083	18.9	82	119
1919	16,432	43.4	488	1,550	4.1	126	14,979	39.6	2,521	4,901	12.9	99	130
1930	20,073	42.7	545	1,637	3.5	150	19,116	40.7	2,876	6,156	13.1	140	142
1931	19,407	40.8	583	1,471	3.1	146	19,172	40.3	3,428	7,512	15.8	165	152
1932	14,825	41.4	548	1,132	3.2	128	12,590	35.1	3,112	7,270	20.3	159	136
1933	17,865	47.2	523	990	2.6	93	11,413	30.2	2,453	7,552	20.0	132	114
1934	20,750	50.1	534	1,004	2.4	119	11,089	26.8	2,288	8,590	20.7	157	114

*Per cent of total mechanically-loaded coal (deep-mines).

†Includes duckbills and hand-loaded conveyors.

‡Number of mines in which hand-loaded conveyors (other than pit-car loaders) are installed; number of *units* of duckbills and other self-loading conveyors is shown in the column immediately preceding.

ond place it won in 1929; Indiana ranks third and Wyoming fourth. After having held the position for four years, Alabama dropped from fifth to eighth place in tonnage; labor troubles which took place in the first quarter of 1934 when the United Mine Workers was staging its successful fight for recognition in that State doubtless was an important contributing factor in this shift.

When comparisons are made on the basis of the percentage of the total output of deep-mine coal produced by mechanical loading in each State, the top position during the past decade has fallen to Wyoming and Montana, with the first-named State holding the lead in five out of the nine years for which Bureau of Mines figures have been published. The Virginias, which were in the upper brackets in 1925, have dropped to tenth (Virginia) and twelfth position (West Virginia) in the 1934 tabulations. The changes which have taken

Table IV—State Leaders in Mechanized Bituminous Mining

	1925		1933		1934	
Rank	State	Tonnage*	State	Tonnage*	State	Tonnage*
1.	West Virginia†	2.48	Illinois	17.12	Illinois	18.48
2.	Illinois	1.29	Pennsylvania	6.68	Pennsylvania	6.55
3.	Indiana	1.03	Indiana	4.22	Indiana	5.40
4.	Wyoming	.58	Wyoming	2.97	Wyoming	3.57
5.	Pennsylvania	.23	Alabama	1.39	West Virginia	1.36
6.	Virginia‡	.22	Montana	1.09	Montana	1.15
7.	Kentucky	.16	Ohio	1.03	Ohio	1.14
8.	Iowa	.02	West Virginia	.79	Alabama	1.07

*Production of mechanically loaded coal in millions of net tons.
†Includes Tazewell County, Virginia.
‡Excluding Tazewell County.

Table V—Per Cent of Total Bituminous Deep-Mined Coal Mechanically Loaded

	1925		1933		1934	
State Rank	State	Per Cent*	State	Per Cent*	State	Per Cent*
1.	Wyoming	8.9	Montana	79.5	Wyoming	84.1
2.	Indiana	5.8	Wyoming	75.8	Montana	79.1
3.	Virginia‡	2.1	Illinois	53.9	Indiana	63.3
4.	Illinois	2.0	Indiana	48.6	Illinois	52.1
5.	West Virginia†	2.0	Utah	20.6	Utah	24.9
6.	Iowa	.4	Washington	19.4	Washington	24.6
7.	Kentucky	.3	Alabama	16.0	Alabama	11.2
8.	Pennsylvania	.2	Pennsylvania	8.5	Pennsylvania	7.3

*Per cent of total State output of deep-mined coal handled by mechanical loaders.
†Includes Tazewell County, Virginia.
‡Excluding Tazewell County.

Table VI—Mechanical Loading Underground in Bituminous Mines, by States, 1933-34

1933

State	Number of Mines: Using loading machines only (including scrapers, duckbills)	Number of Mines: Using conveyors only (that is pit-car loaders and other hand-loaded conveyors)	Number of Mines: Using both loading machines and conveyors	Number of Mines: Total less duplications	Number of Machines: Mobile loading machines	Number of Machines: Scrapers	Number of Machines: Duckbills and other self-loading conveyors	Number of Machines: Pit-car loaders	Number of Machines: Installations of hand-loaded conveyors[1]	Production Mechanically Mined (net tons): Loaded by machines	Production Mechanically Mined (net tons): Handled by pit-car loaders and other hand-loaded conveyors	Production Mechanically Mined (net tons): Total	Total Production of Mechanized Mines (net tons): Mines using loading machines only (including scrapers, duckbills, etc.)	Total Production of Mechanized Mines (net tons): Mines using conveyors only (that is, pit-car loaders and other hand-loaded conveyors)	Total Production of Mechanized Mines (net tons): Mines using both loading machines and conveyors	Total Production of Mechanized Mines (net tons): Total
Alabama	3	22	1	25	[2]	9	...	144	14	176,547	1,212,761	1,389,308	877,755	2,497,402	118,442	3,493,599
Arkansas	2	5	...	7	...	[2]	...	...	5	[2]	[2]	144,736	[2]	[2]	...	144,736
Colorado	1	4	2	7	7	...	...	9	4	32,938	38,029	70,967	115,355	345,233	129,445	590,033
Illinois	11	24	17	52	281	...	...	1,444	1	10,351,282	6,770,344	17,121,626	3,761,178	6,459,511	8,747,947	18,968,636
Indiana	10	10	5	25	91	...	...	167	1	3,146,318	1,076,037	4,222,355	2,849,712	1,141,168	898,362	4,889,242
Iowa	...	1	...	1	...	...	...	...	1	...	[2]	[2]	...	[2]	...	[2]
Kentucky	2	5	...	7	7	[2]	...	90	2	[2]	[2]	789,755	[2]	[2]	...	3,261,898
Maryland	...	2	...	2	...	...	...	...	2	...	[2]	[2]	...	[2]	...	[2]
Michigan	...	1	...	1	...	...	...	...	1	...	[2]	[2]	...	[2]	...	[2]
Missouri	...	3	...	3	...	...	...	...	3	...	80,923	80,923	...	80,923	...	80,923
Montana	2	1	4	7	26	...	5	35	1	913,885	173,443	1,087,328	462,126	10,295	717,773	1,190,194
New Mexico	1	...	...	1	...	[2]	...	...	...	[2]	...	[2]	[2]	...	...	[2]
Ohio	3	...	1	4	17	[2]	...	[2]	...	[2]	[2]	1,028,668	[2]	...	[2]	1,552,010
Pennsylvania	11	56	7	74	30	52	17	457	48	1,380,169	5,302,299	6,682,468	2,863,890	13,967,200	2,255,219	19,086,309
Tennessee	...	1	1	2	[2]	...	...	...	2	[2]	[2]	[2]	...	[2]	[2]	[2]
Utah	8	1	1	10	31	[2]	...	[2]	1	[2]	[2]	551,172	[2]	[2]	[2]	1,369,461
Virginia	...	3	...	3	...	...	...	...	3	...	370,305	370,305	...	628,831	...	628,831
Washington	1	4	...	5	...	...	[2]	...	4	[2]	[2]	270,858	[2]	[2]	...	321,946
West Virginia	4	15	3	22	8	4	4	16	15	400,789	393,491	794,280	547,255	2,602,561	990,980	4,140,796
Wyoming	9	8	7	24	22	10	104	88	6	2,364,188	605,732	2,969,920	1,194,970	614,595	1,580,647	3,390,212
Undistributed	...	...	...	...	3	18	2	3	...	1,745,405	1,285,576	245,792	3,719,467	3,013,452	642,011	724,879
Total	68	166	49	283	523	93	132	2,453	114	20,511,521	17,308,940	37,820,461	16,391,708	31,361,171	16,080,826	63,833,705

1934

State	Number of Mines: Using loading machines only (including scrapers, duckbills)	Number of Mines: Using conveyors only (that is pit-car loaders and other hand-loaded conveyors)	Number of Mines: Using both loading machines and conveyors	Number of Mines: Total less duplications	Number of Machines: Mobile loading machines	Number of Machines: Scrapers	Number of Machines: Duckbills and other self-loading conveyors	Number of Machines: Pit-car loaders	Number of Machines: Installations of hand-loaded conveyors[1]	Production Mechanically Mined (net tons): Loaded by machines	Production Mechanically Mined (net tons): Handled by pit-car loaders and other hand-loaded conveyors	Production Mechanically Mined (net tons): Total	Total Production of Mechanized Mines (net tons): Mines using loading machines only (including scrapers, duckbills, etc.)	Total Production of Mechanized Mines (net tons): Mines using conveyors only (that is, pit-car loaders and other hand-loaded conveyors)	Total Production of Mechanized Mines (net tons): Mines using both loading machines and conveyors	Total Production of Mechanized Mines (net tons): Total
Alabama	5	13	3	21	...	23	[2]	143	11	142,505	928,781	1,071,286	[2]	2,098,325	[2]	3,232,446
Arkansas	3	5	...	8	...	[2]	...	...	5	[2]	[2]	208,826	[2]	[2]	...	208,826
Colorado	...	1	2	3	[2]	...	[2]	[2]	3	[2]	[2]	65,076	...	[2]	[2]	215,660
Illinois	13	19	16	48	281	...	...	1,336	1	11,643,841	6,838,506	18,482,347	6,179,997	6,838,121	8,621,609	21,639,727
Indiana	10	9	9	28	96	...	...	165	2	4,199,727	1,202,959	5,402,686	3,182,488	963,385	1,912,004	6,057,877
Kentucky	...	7	1	8	...	[2]	...	90	4	[2]	[2]	743,629	...	[2]	[2]	2,702,084
Maryland	...	2	...	2	...	...	...	...	2	...	[2]	[2]	...	[2]	...	[2]
Missouri	...	2	...	2	...	...	...	...	2	...	[2]	[2]	...	[2]	...	[2]
Montana	2	1	5	8	29	...	[2]	44	1	876,837	271,591	1,148,428	[2]	[2]	775,377	1,270,360
New Mexico	2	...	...	2	...	[2]	...	...	...	[2]	...	[2]	[2]	...	...	[2]
North Dakota	1	...	...	1	[2]	...	...	...	...	[2]	...	[2]	[2]	...	...	[2]
Ohio	6	...	...	6	19	[2]	...	...	...	1,136,398	...	1,136,398	2,222,033	...	...	2,222,033
Oklahoma	1	...	...	1	...	[2]	...	...	...	[2]	...	[2]	[2]	...	...	[2]
Pennsylvania	8	46	8	62	32	53	[2]	[2]	43	1,385,791	5,162,187	6,547,978	2,651,754	13,086,403	3,461,647	19,199,804
Tennessee	...	1	1	2	[2]	...	...	...	2	[2]	[2]	[2]	...	[2]	[2]	[2]
Utah	9	2	1	12	36	...	...	[2]	2	565,385	34,108	599,493	1,379,625	[2]	[2]	1,519,375
Virginia	...	3	...	3	...	...	...	...	3	...	384,956	384,956	...	625,131	...	625,131
Washington	1	4	...	5	...	...	[2]	...	4	[2]	[2]	340,685	[2]	[2]	...	390,796
West Virginia	9	22	3	34	14	[2]	3	[2]	25	691,071	673,865	1,364,936	1,790,992	4,163,879	1,013,646	6,968,517
Wyoming	11	7	6	24	21	[2]	128	76	4	2,956,704	614,900	3,571,604	1,897,909	[2]	[2]	3,997,022
Undistributed	...	...	...	...	6	43	26	434	...	237,801	1,484,822	364,407	2,160,892	3,214,758	3,265,261	1,255,578
Total	81	144	55	280	534	119	157	2,288	114	23,836,060	17,596,675	41,432,735	21,465,690	30,990,002	19,049,544	71,505,236

[1]Number of mines in which hand-loaded conveyors (other than pit-car loaders) were used.
[2]Included under "Undistributed" to avoid disclosing individual operations.

Table VII—Anthracite Mechanized Output by Types of Machine

	1932 Net tons	1933 Net tons	1934 Net tons
Mobile loading machines	60,561	48,078	37,227
Scraper loaders	2,591,030	2,347,325	2,980,514
Pit-car loaders	30,874	62,586	63,106
Hand-loaded face conveyors*	2.750,875	4,099,278	6,203,639
Total	5,433,340	6,557,267	9,284,486

*Shaker chutes etc., including those equipped with duckbills.

place in percentage ranking in the first eight States are shown in Table V.

Mobile and pit-car loaders are responsible for only a very small part of the mechanized production of the Pennsylvania anthracite region. For 1934, the combined percentage of deep-mined coal handled by these types of equipment was only approximately 1.1 per cent of the total mechanized output. Hand-loaded face conveyors, including shaker chutes equipped with duckbills, contributed 66.8 per cent of the total, and scraper loaders, 32.1 per cent. In 1932, the percentages for the two types just mentioned were 50.6 and 47.7, respectively. On a tonnage basis, the output handled by scraper loaders in 1934 was 389,484 tons greater than in 1932, while the output handled by hand-loaded face conveyors last year exceeded the 1932 figure by 3,452,764 tons. Most of

Table VIII—Indices of Relative Trends in Mechanical-, Hand- and Strip-Mining: 1927-1934

	Anthracite			Bituminous		
Year	Mechanical (Index Numbers)	Stripping (Index Numbers)	Hand (Index Numbers)	Mechanical (Index Numbers)	Stripping (Index Numbers)	Hand (Index Numbers)
1927	100	100	100	100	100	100
1928	106	113	94	131	108	95
1929	156	89	93	230	110	99
1930	201	118	85	285	108	83
1931	197	177	69	288	103	65
1932	244	185	54	217	107	53
1933	295	229	48	229	99	57
1934	418	269	54	251	111*	61*

*Preliminary

the mechanized production—7,681,070 tons out of the total of 9,284,486 tons in 1934 and 5,676,221 tons out of 6,557,267 tons in 1933—came from the Northern field. Hand-loaded conveyors in that field handled 3,558,258 tons in 1933 and 5,145,240 tons last year.

Haulage at Lehigh Navigation Collieries

(Concluded from page 406)

riveted the pedestals and bottom, side and end plates. Weight of the frame was 1,300 lb. Principal difficulties encountered with this type of frame was loosening of the bottom plates and pedestals in service. The pedestal difficulty was later corrected by casting them integrally with the frame.

In 1930, as a result of improvements in the steel-casting art, cast-steel underframes complete with flat bottom and pedestals (Fig. 6) were adopted. These and other types of frames were furnished by the General Steel Castings Corporation, Taylor-Wharton, Reading Iron Co., Vulcan Iron Works and Buckeye Steel Castings Co. Weight of this underframe averages about 2,250 lb. Closely following the adoption of the solid-bottom underframe was the development by the General Steel Castings Corporation of the "bathtub"-type Commonwealth underframe shown in Fig. 7. The depressed bottom characterizing this type resulted in an increase in capacity to 131 cu.ft. These underframes were designed to accommodate draft and buffing gear (Miner, Class "S") in a box-sectioned end sill to distribute longitudinal shocks over the entire frame. Weight of this type of underframe was 2,000 lb.

The company also turned to an investigation of the all-welded underframe embodying integral pedestals and floor plate. A total of 100 of these frames (Fig. 11), supplied by the American Car & Foundry Co., have been placed in service in the four years since the first was installed, with improvements in design dictated by experience with the originals. Weight of these underframes is approximately 2,190 lb. and welding has been found, on the basis of experience to date, an effective method of checking damage from corrosion.

A modification in the design of the cast-steel underframe is the "corrugated-bottom" type shown in Fig. 9. Weight of this frame, a Buckeye unit, is approximately 1,820 lb., and 150 have been installed. Car capacity with this frame is increased to approximately 120 cu.ft. Another feature, also characterizing the "bathtub" underframe and the late-type flat-bottomed underframe with upstanding flange, is the fact that depth of side and end plates is reduced 6 in. This has permitted the salvaging of old side plates by cutting off the bottom 6 in. and thus getting rid of the section containing the rivet holes most subject to corrosion, and thereafter riveting them to the new underframes (Fig. 10).

Roller bearings are employed exclusively in the cars used underground at the Lansford, Coaldale, Greenwood and Tamaqua collieries. Except for the Tamaqua cars, which are of the end-gate type, all cars at these four collieries are designed for rotary-dump service and therefore are built with solid ends. Mechanical equalized brakes are used on all cars at the Lansford, Greenwood and Tamaqua collieries, and have been found effective in preventing many of the flat wheels otherwise encountered where sprags are employed to control movement on grades. Inside wheels are standard. Hyatt bearings mounted in the journals are employed on the Coaldale, Greenwood and Tamaqua cars. At Lansford, cars have Timken bearings mounted in the wheels.

Reduction of shock to cars through starting and stopping of trips has gone hand in hand with developments in steel-car design at Lehigh Navigation collieries. On earlier types of cars, springs in the center drawheads were employed to reduce starting shock. Next came the spring-type draft and buffing gear used with the "bathtub" underframes and designed to cushion both starting and stopping shocks. Search for a still better method of eliminating the effects of shock led company officials to investigate the possibility of adapting the railroad-type friction draft and buffing gear to mine-car service, and such a gear (Miner, T-3) with alloy-steel coupler is now standard for mine-car installation. Spring supports on axle mountings are employed to reduce shock not only to car bodies but also to bearings and axles. These mountings also compensate for track irregularities and thereby better the riding qualities of the cars.

Wheels and axles also have received their fair share of attention in revisions in mine-car design. These efforts have been directed primarily toward the adoption of special high-strength and long-wearing metals. In the wheel category, in addition to the standard cast iron, metals which have been employed include manganese steel, cast steel and special alloy cast iron, the latter being the most numerous of the special types. Under service conditions at Lehigh Navigation collieries, bent axles were frequent, and to overcome this difficulty and increase life through greater strength and resistance to wear, a number of cars have been equipped with axles of heat-treated alloy steel, manufactured by the Bethlehem Steel Co., at a cost of two to three times that of ordinary axles.

The Lansford cars offer a striking example of the use of new materials and constructions on mine-car service. These cars, equipped with brakes, flat-bottomed cast-steel underframes, American Car & Foundry Co. special alloy cast-iron wheels and Timken roller bearings, have been in service since 1928 with no underframe failures, the replacement of only one roller bearing and two wheels, and a minimum of cost for other maintenance items.

NOTES
From Across the Sea

IN British mines a strong objection exists against the use of water at the working face and this has caused the Safety in Mines Research Board to suggest the use of carbon dioxide, locally applied on the cutter bar to extinguish the flame of ignited gas and to prevent the coal from burning as a result of the heat generated by cutting.

A solid carbon dioxide known commercially as Drikold is carried on the coal-cutting machine in a standard liquefier, and the escaping gas, says Prof. I. C. F. Statham, University of Sheffield, in *Colliery Engineering*, is directed through a copper pipe into the undercut. Apparently, $1\frac{1}{2}$ cu.ft. of the dioxide per minute when cutting in sandstone prevented atmospheric ignitions of firedamp and even less made ignitions more infrequent. A continuous discharge of this quantity over a period of 7 hours is obtainable from 75 lb. of Drikold costing $3.77, but when running $4\frac{2}{3}$ hours, which more closely approximates actual running time, 50 lb. would suffice, costing $2.55. A pressure gage can be used to indicate the rate of delivery. Thus far the new method has not been tested in a mine.

Though the cost is large, the means suggested is far more practical than the proposal to render the entire air of a mine explosion-proof by the use of carbon dioxide, which air the miners would have to breathe. It would seem that water would be equally effective in preventing sustained ignition and in rendering initial ignition less likely, for bits and material cut would both be kept at a low temperature, but its effect on heaving bottom must be considered.

THAT American coal cannot be briquetted without binder has generally been accepted as a dictum almost beyond question. But in Illinois, coal is being briquetted—not yet commercially, it is true—by the impact of a falling weight, and now an engineer in Holland, A. ten Bosch, has managed to make a briquet that looks like ebonite without the use of any binder. His investigatory work has been done on many coals, including some low-volatile varieties from the United States.

Briquetting without binder has the advantage that not only is the cost of the binder eliminated but that no oil or tar is added to increase the smokiness of the briquet; nor will such product weaken with heat and become sticky.

Success in making briquets with the ten Bosch machine has caused the well-known Gutehoffnungshütte, of Düsseldorf, Germany, to build a full-size press for installation in one of its large mines. The coal is ground to 0.2 mm. size, which is about the equivalent of 65-mesh on the recognized U. S. standard. Different coals, however, need different treatment. Some must be preheated and some dried. The coal dust enters from above and is pressed in a four-die horizontal press, with eight plungers working as opposing pairs; four compress the coal into the front dies and four push out the four briquets when formed. The cranks which operate these plungers work completely in oil. The briquetting pressure is 5,000 kg. per square centimeter, or about 70,000 lb. per square inch. The evacuating pressure is 300 to 500 kg. per square centimeter, or, roughly, 4,300 to 7,000 lb. per square inch. Briquets on leaving the dies will fall out at the bottom of the press onto a belt and be carried to the loading point. To aid in their shaping and their removal from the dies, the briquets are made slightly conical with the smaller ends toward the evacuatory plunger.

Running at 80 to 100 r.p.m., the press will make 320 to 400 briquets per minute, each weighing 55 to 64 grams, or 0.12 to 0.14 lb. Output will be, therefore, 38.4 to 56 lb. per minute, or 16,128 to 23,520 lb. per seven-hour day. One man should be able to attend ten presses, as the operation is entirely automatic. The cost per short ton for labor, depreciation and power has been estimated at $1.16 to $1.43. Electric power to drive a press is about 50 kw.

The American coals tested came from Pennsylvania, the New River and the Tazewell districts, all having between 22 and 23 per cent volatile matter and between 5 and 6.75 per cent ash. They were all compressed at 20 deg. C. and had a final moisture of 2 per cent on compression. The compressive strength of the finished briquets was 1,422 lb. to 1,593 lb. per square inch. The briquet, which looks like anthracite, is said to burn readily, not only because of the volatile matter present but because there are microscopic pores which give the flames an opportunity to attack the coal substance. According to a State report, the briquets burn without losing shape or melting and hold fire well when the furnace is damped down. When given air they radiate much heat.

R. Dawson Hall

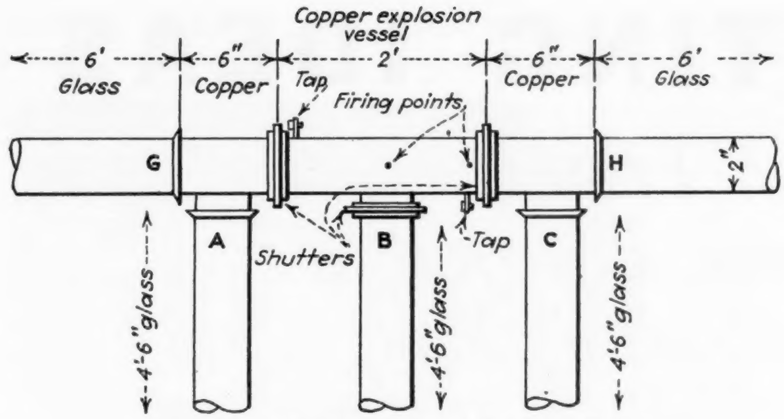
On the
ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Where no price is appended in the notice of a publication of the U. S. Bureau of Mines, application should be directed to that Bureau. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

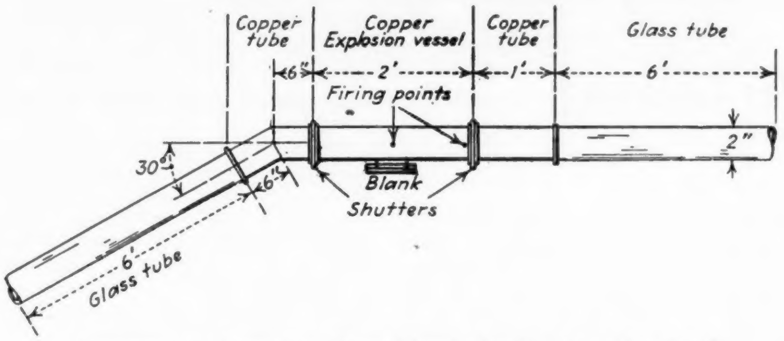
Firedamp Explosions: The Projection of Flame; Part III—The Effect of Branch Galleries and of Bends, by M. J. Burgess. Safety in Mines Research Board (British), No. 83. British Library of Information, New York. 20 pp. Price, 17c.

It has already been determined (S.M.R.B. No. 27) that in the ignition of methane-air mixtures in small tubes, flame was projected a distance several times the length of the original column of explosive mixture and (S.M.R.B. No. 42) that such experiments were applicable, with reasonable accuracy, to explosions in galleries the size of a mine roadway. For this reason experiments have been made to discover how far flame from such mixtures will extend in the presence of branch galleries and bends.

In the case of branch galleries experiments were made with percentages of methane varying from 6.05 to 13.85, several percentages of each, but these percentages, unfortunately, are not exactly the same for each type of experiment, making exact comparison impossible. However, the following figures are illustrative, taking the percentage as near 8 as possible. The ignition was made at the center or at one end of the column of gas, but the figures quoted are for central ignition. The length of the original column of gas was 24 in. and the tubes were of 2-in. diameter.



Apparatus to determine effect of branch galleries



Apparatus to determine effect of bends fitted with 30-deg. bend

The bulletin draws no conclusions as to the effect of the openings within the explosive mixture, and the reader will be at a loss to draw any. Apparently with an opening only in the central branch tube the projection of flame is increased (6) as a whole, but the flame extends furthest along the straight tube when there are no branches in which flame may be projected (2). Experiments also were made with end ignition.

Bends also were tested with the bend 6 in. from the end of the column of explosive mixture as measured to the outside edge of the bend. "With central ignition the distance of projection tended to be less along the bent limb of the tube, but was not always so. The two richest mixtures gave abnormally long distances of projection when the angle of the bend was 90 deg. When the point of ignition was near the end of the explosive column remote from the bend, the effects of the 30- and 60-deg. bends were not marked, but the 90-deg. and 120-deg. bends caused flame to be projected much further, in both directions, than in the straight tube."

L'Evolution de l'Exploitation des Mines Domaniales de la Sarre, by Felix Leprince-Ringuet, Dunod, Paris, France. 95 pp., with one chart in color and nine black.

This report on the operations of the government-owned mines of the Saar details the geological features of the basin. The coal beds are found on one flank of a syncline, badly complicated by faults. The southwestern end is further complicated by an anticlinal which turns over the flank abruptly, causing two of the beds to pitch vertically. The basin runs east-northeast. It has 21 shafts for the extraction of mineral, 14 in medium-volatile coal, 5 in coal of long-flame type and 2 in the Ottweiler beds.

Of the coal mined in January, 1934, 4.7 per cent was shot off the solid, 25.5 per cent was undercut by longwall machines and brought down by explosives, 1.0 per cent was undercut by rotary percussion cutters and dislodged by explosives, 38.5 per cent was mined solely by pickhammers, 8.2 per cent with pickhammers and longwall machines, 2.2 per cent by pickhammers and rotary percussion cutters, 0.8 per cent by longwall machines followed by hand picks, 0.9 per cent with rotary percussion machines followed by hand picks and 18.2 per cent by hand picks alone. The use of explosives was increasing, so also was the use of pickhammers, and hand picking in the face was rapidly decreasing, as also the use of the rotary percussive cutter. The report gives broad operating outlines without detail.

Briquetting Illinois Coals With a Binder by Impact, Second Report of a Laboratory Investigation by R. J. Piersol. Illinois Geological Survey, Urbana, Ill. Report of Investigations No. 37.

A 500-lb. hammer was used to afford the impact, and it was found that the most easily briquetted coal came from Washington County. The drop required for the coal was 2½ to 5 ft., a fall of 4½ ft. giving the best results. With the less easily briquetted coal from Franklin County a fall of 3½ to 5½ ft. was required, with best results at 5 ft.

Preheating from 150 to 325 deg. C. was needed for the former coal, with 250 deg. C. the most satisfactory temperature. Franklin County coal needed a temperature between 150 and 350 deg. C., but at all temperatures within that range equally good results were obtained. In all cases the preheating was found to be most effective when continued for 10 minutes.

Tumbling tests showed that, up to 20 per cent ash, the presence of mineral matter did not decrease the strength of the briquet. The strength of artificially blended briquets never exceeded that of those formed from natural coal, but pure vitrain made a distinctly weak briquet; fusain when added to clarain by small increments resulted in briquets of decreasing strength until, with 25 per cent of fusain, no briquet could be formed. However, when fusain was added to vitrain, the briquets obtained increased in strength until 5 per cent of fusain was used. After that, any increase in fusain reduced the strength of the briquet until with 25 per cent of fusain the briquets could not be formed.

The lower the rank of the Illinois coals tested the better the briquets obtained. Coal with unit B.t.u. values of 14,200 to 15,000 were tested. Excluding the effects of rank, the Illinois coals all gave about equally good results.

Standard accelerated weathering tests showed that Will, Sangamon and Franklin County briquets stood eight cycles of wetting and drying without slacking, whereas natural Illinois coals from the same counties evidenced slacking at end of first cycle. Outside exposure for 90 days, from Feb. 24 to May 25, 1934, of Will, Washington and Franklin County briquets resulted in no disintegration and an average decrease of 1.3 per cent in calorific value. The energy required for briquetting could be generated by only 50 lb. of coal per ton of briquets, a small cost as compared with the cost of binder in processes where binder is used.

Effect of Side Openings on Projection of Flame (Central Ignition)

	Projection in Inches						
Methane Percentage	Left End Straight Tube G	Left Branch Tube A	Central Branch Tube B	Right Branch Tube C	Right End Straight Tube H	Total All Tubes	Total Projection / 24*
(1) 8.0–8.10	18.5	BO	11.0	BO	18.5	48.0	2.00
(2) 8.0–8.2	31.5	BO	BO	BO	31.5	63.0	2.63
(3) 8.05	19.5	14.5	13.0	BO	18.5	65.5	2.73
(4) 8.6–8.75	20.5	17.0	12.5	18.0	20.0	88.0	3.67
(5) 8.25	29.5	28.5	BO	BO	31.0	89.0	3.71
(6) 7.75–7.85	26.5	25.0	BO	25.5	27.0	104.0	4.33

BO in a column shows that the tube to which it refers was blanked off so that the explosion could not extend in that direction. *24 is the length in inches of the column of the explosive mixture.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

Twenty Man-Days Saved Per Greasing By Mine-Car Installation

AN INVESTMENT in an electrically operated grease dispenser which pumps from the shipping container and meters the quantity delivered to each bearing paid for itself in twelve months, according to S. J. Dickenson, general manager, Mary Helen Coal Corporation, Coalgood, Ky. Labor constitutes the principal saving, but there is an additional saving by a reduction in grease consumption and the assurance that every bearing gets sufficient uncontaminated lubricant to last until the next greasing.

The saving was calculated by comparing with greasing by an air-pressure unit which was installed several years ago and effected a large saving over hand-gun methods. The air-pressure machine still is used at the same time as the electric dispenser, however, to reduce further the total time required to grease the 600 cars used at Mary Helen mine. Because about 90 minutes of car-greasing time was lost by the normal hand method of refilling and in rebuilding pressure in the air machine, the new electric dispenser is burdened with the auxiliary duty of pumping grease from original containers to refill the pressure tank of the air equipment. This transfer of a drum of grease (approximately 400 lb.) is effected in 36 minutes, although it is a duty rather severe for an electrical device designed for the intermittent work inherent in regular car greasing.

The electric dispenser—Type No. 6110, made by the Alemite Corporation, a division of the Stewart-Warner Corporation—is made ready for use by setting it on top of the standard opening in the head of a 400-lb. drum. In this position the lower end of the tube, where the pump and its suction are located, is close to the bottom of the drum, thus effecting almost complete emptying of the container. Only three minutes is required to exchange the empty drum for a full one and to shift the dispenser from one to the other. The dispenser, which has a rated capacity of 15 lb. per minute, is powered by a motor which can be operated from either 220 volts a.c. or 275 volts d.c. The motor is equipped with an automatic switch to stop it when the pressure reaches 300 lb. per square inch.

Car-greasing station and equipment at Mary Helen mine. Pipe connections serving the two hoses through meters are buried under the tracks

Greasing is done under a shed in the mine yard, where permanent piping has been installed with a hose connection on each side of the track. Meters connected between pipe outlet and hose indicate to each greaser the quantity of lubricant forced into the wheel. Under the present schedule of greasing all cars once every six months, 1½ pints of grease is applied per wheel and approximately eight 400-lb. drums of grease is required for one application to the 2,400 bearings. The meter is of particular advantage if the man handling the grease hose is inexperienced. Without it he might erroneously assume that sufficient grease had been forced into a bearing.

When only the air-pressure machine was being used, nine men worked 29 to 34 hours to complete the greasing of the 600 cars. Now, with both electric and air equipments in use, nine men accomplish the same work in 14 to 17 hours. Thus, the electric machine effects a saving of approximately 140 man-hours per general greasing.

To obviate the removal of plugs the cars were equipped with Alemite giant flush-type fittings which open and take the grease when the hose nozzle is pressed against them. Preliminary to applying the nozzle the fitting is cleaned by a few turns of a hand-driven rotating scraper. These flush-type fittings were installed on the car wheels several years prior to purchase of the electric greasing equipment.

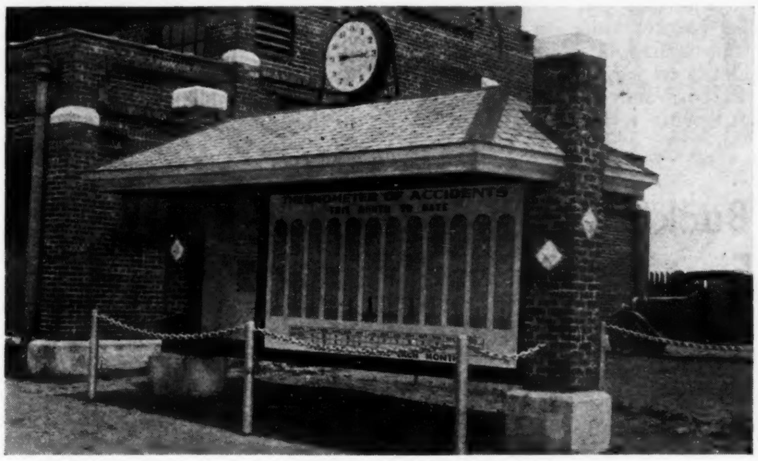
Grease containers of the type with removable head are adapted to use with the electric gun by temporarily replacing the regular head with one in which a hole of the standard size has been cut. A few containers of this removable-head type have been handled at Mary Helen mine.

Excepting during the semi-annual "field days" of car greasing, the electric dispenser is kept in the shop, where it is utilized to lubricate repaired cars. In this duty, as well as in the semi-annual jobs, the feature of grease cleanliness is considered of outstanding importance. Because the grease is fed directly from the shipping container and the dispenser base flange closes the container opening, there exists practically no chance for entrance of sand and grit.

Safety Board Catches Eye

Attractive appearance plus a distinctive method of presenting a record of lost-time injuries are features of a safety board installed at a northern Indiana mine and shown in the accompanying illustration. The board consists of a clock-type indicator showing the cumulative number of lost-time injuries in any particular month; "thermometers" showing the number of injuries by mine sections and departments; a glass-inclosed bulletin board for notices and safety posters; and, on the bottom, a chart showing the accident rating for the month as compared with the same month in the previous year.

The thermometers consist of glass tub-



Pleasing appearance accompanies usefulness of this safety board

ing of the type used for neon signs. To indicate an injury, denatured alcohol colored with red gasoline dye is poured in to the proper mark. The tops of the tubes extend to the rear of the board for filling, and the bottoms, also extending to the rear, are made in the shape of a U-tube so that when the tubes are drained at the end of the month, enough alcohol remains to show in the bulb. Tubes are filled with a common oil can, and the quantity required is small, 1 qt. sufficing to fill all the tubes installed on the board.

The clock over the roof of the board is of thin-gage metal with arrow and numerals cut out, and the center disk, carrying the arrow, is movable. A light is installed behind the face to illuminate the figures and arrow at night. The board below the roof also is lighted at night, the general effect being more striking than in the daytime. The men watch the clock and thermometers closely and, when there is any change, read the description of the accident as posted on the bulletin board.

The board was constructed by the top force in periods when no other duties required their attention, and. considering their time at the regular rate, the total cost of the board, including materials—which were salvaged around the plant—was slightly over $300. An aluminum-painted guard fence of old boiler flues and worn chain was added later to keep men from accidentally leaning against the glass tubes or rubbing dirt on the light paint.

Driving Ball Bearings

Where a ball bearing must be driven onto its seat, trouble sometimes is encountered through the tendency of the bearing to cock, points out John E. Hyler, Peoria, Ill., in offering a special driving tool. If there is the slightest degree of out-of-roundness in the shaft, though it may be so small as to result in no distortion of the bearing after it is in place, it will cause the bearing to rock on the high points and thus cock each time a light blow is struck where the bearing ring is relatively loose on the shaft.

This trouble can be overcome through the use of a special driving tool made of a piece of pipe that will fit easily over the bearing seat on the shaft and against the inner race of the bearing. "It is evident that when the end of the piece of pipe is cut perfectly square and is held against the bearing ring in such a manner that the axes of the pipe and shaft are identical or parallel, light hammer taps on the outside end of the pipe will be distributed evenly all around the bearing ring. The end of the pipe will hold the race in such a manner that it cannot cock.

"It is not recommended that the end of the pipe be placed directly in contact with the bearing race, however. A light ring of either leather or plywood or sheet lead should be interposed between the pipe end and the bearing, or such a ring may be attached permanently to the end of the pipe, if preferable. Such rings can be cut quickly from any of these materials by the use of two different sizes of hole saws mounted in a portable drill."

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On the Dot

WHEN the desired daily tonnage and the end of the shift coincide, a mine can be termed a smooth-running operation. Such a meeting, however, requires coordination of all activities, both great and small, entering into the process of getting the coal out of the ground. Insuring such coordination requires, first, the prevention of all possible interruptions and, second, quick action in case an interruption does occur. The man fortified with a wide knowledge of how the other fellow has tackled the problem will function best in both prevention and cure. These pages are designed to supply that knowledge to operating, electrical, mechanical and safety men at the mines, and in turn draws on their experience. If you have a solution for any of the many problems that can arise in mining coal, send it in. Acceptable ideas will bring their authors $5 or more each.

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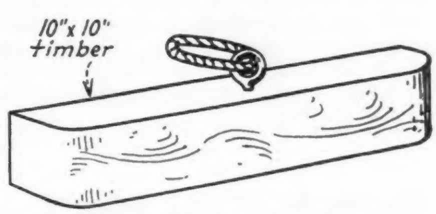
Snow Plow

While in charge of mines of the Davis Coal & Coke Co., Davis, W. Va., writes Walter Iman, Kitzmiller, Md., considerable difficulty was encountered in keeping long tramroads free of snow in the winter. Several plans of clearing the tracks were tried, and finally a simple plow to be mounted on the locomotive bumper was adopted. This plow was made of a 10x10-in. timber with a length corresponding to the width of the locomotive frame. The ends were rounded as shown, and a hole was bored in the center to accommodate a $1\frac{1}{4}$-in. eyebolt in which a regular coupling link was inserted.



Details of Plow and Connections

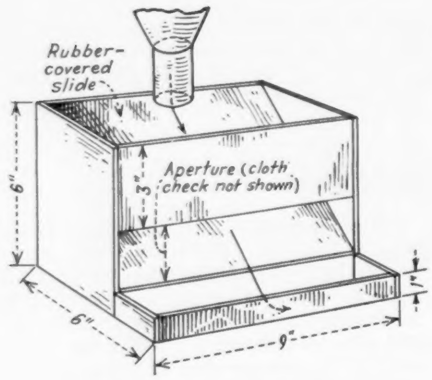
The link was used to couple the plow on the front end of the locomotive so that there was just enough space between the plow and the bumper to allow free movement of the plow, but enough to allow it to turn or slip sidewise. On stormy days, the plow was used on the front end of the locomotive throughout the shift.

Belt Conveyor Handles Checks

Something different in methods of getting checks from the dump into the weigh office characterizes operations at the No. 1 mine, Lorado Coal Mining Co., Lorado, W. Va. As the dump is on the opposite side of the track from the weigh office, Philip France, weighmaster, points out that it was impossible to use the customary tube or pipe for the checks to roll through. Consequently, it was decided to employ a belt conveyor.

The conveyor, constructed by the company's electricians, was built of two 2x6-in. pine scantlings 30 ft. long cleated together on the bottom. A 4-in.-wide belt was used, and is supported at either end by steel rollers, the roller in the weigh office having a pulley attached to which a $\frac{1}{4}$-hp. motor is connected. Two rows of small wooden rollers 3 ft. apart support the belt between the steel rollers. Directly under the steel roller at the dump a steel idler roller plays up and down in two slotted 2x6's, keeping the belt taut at all times.

When a check drops off the belt it falls through a funnel-shaped tin tube into a specially built check box a few inches from the end of the scales and directly in front of the checkweighman. This box was



Details of check box

built out of an ordinary cigar box about 6 in. deep. The checks strike a rubber-padded slide and pass through an aperture into a receptacle about 2 in. wide by 1 in. deep. A small curtain of stout cloth placed over the aperture slows up the checks sufficiently to prevent them bouncing out of the box. Both conveyor line and check box have been in satisfactory service for about two years.

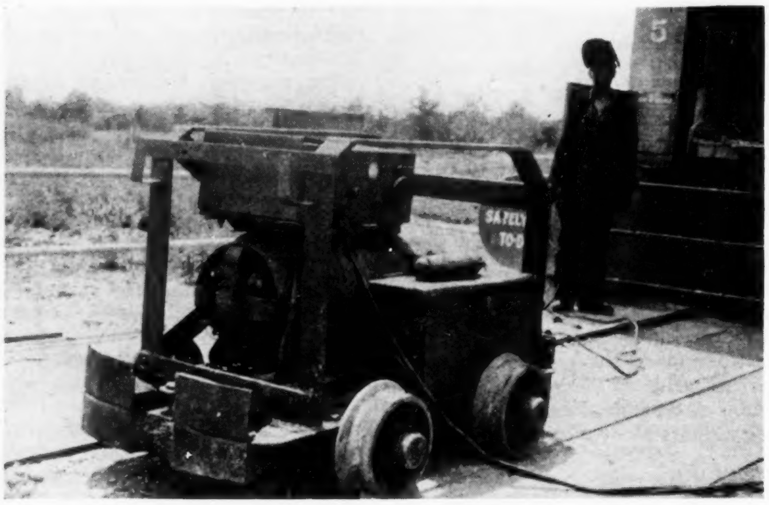
Electric Arc-Welder Adapted To Mine Use

A northern Indiana mechanical-loading mine has found an electric arc welder practically indispensable for repair and maintenance work underground, as well as on the surface. As all loading and cutting machines are some two to three miles from the shaft, it quite often is impossible to tram them out between shifts, therefore making it desirable to have an easily portable welder which may be quickly pulled to any point underground or on the top by a locomotive.

The Lincoln welder employed was purchased with base only and the company specified that it was to be driven by a direct-current motor to permit it to be used both inside and outside the mine. At the mine, it was mounted on a simple steel bed with extended bumpers on regular roller-bearing mine-car trucks. To avoid transmission of jars and shocks to the welder, steel springs were inserted between its base and the steel truck, thus, in effect, giving it "floating power."

A large box to hold the electrodes, a hand-type fire extinguisher, the over-all protective steel frame made of old mine-car drawbars, and two brackets on which the electric cable may be wound are shown in the accompanying illustration.

Adaptability to underground as well as surface use features this electric welder



Bit Bucket Designed to Prevent Loss As First Step in Hard-Surfacing

INTRODUCTION of hard-surfacing of cutter bits, to be successful, requires the use of bit containers that will prevent loss. Such a container was sought as a preliminary to the use of hard-surfacing material at the St. Ellen mine of the Perry Coal Co., O'Fallon, Ill. (p 411 of this issue), and as a result the container described here was developed by Walter Baum, master mechanic. Convenience and sufficient strength to resist shocks such as may be encountered in being dumped and run over a shaker screen were the major objectives in design.

The side of the bucket is made of a $\frac{1}{16}$x$10\frac{1}{2}$x29-in. piece of sheet steel, which is marked off as in Fig. 1. This sheet is bent to shape on a bender made of an 18-in. length of 6-in. pipe to which is clamped a 1x1-in. bar. Interval between the bar and the pipe, which are parallel, is $\frac{3}{16}$ in. To bend the sheet, the end is inserted in the slot between bar and pipe and then pressed down, the process being repeated until half the sheet is bent, whereupon the sheet is turned around and the process repeated, starting at the other end. When completely bent, the ends of the sheet are lapped over and riveted with $\frac{1}{4}$x$\frac{1}{2}$-in. rivets.

The bottom and double lid are formed as in Figs. 2, 3, 4 and 5. The jig used in forming the bottom (Fig. 2) consists of one $\frac{3}{8}$-in. cover plate (A) $8\frac{7}{16}$ in. in diameter, and one $\frac{5}{8}$-in. forming plate (B) $8\frac{9}{16}$ in. in diameter. Plate B, which has one edge rounded off as indicated to prevent cutting the plate in forming, is fastened to a round or square steel block (C) by $\frac{3}{8}$x$1\frac{1}{2}$-in. bolts with countersunk heads. The

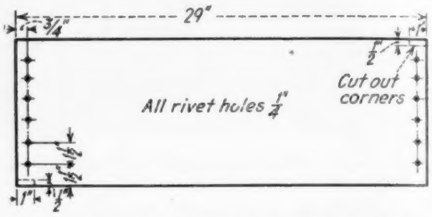


Fig. 1—Details of side sheet for bit bucket

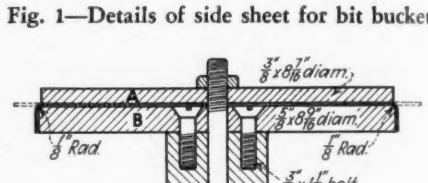


Fig. 2—Jig for forming bottom

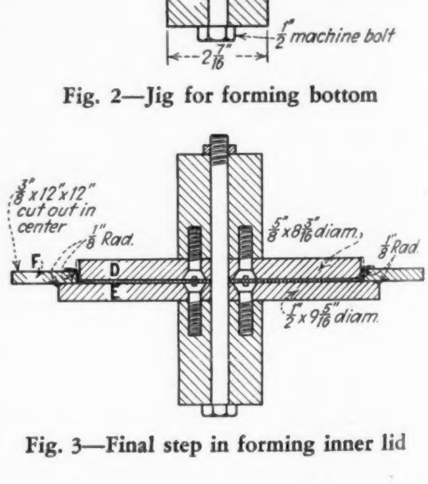
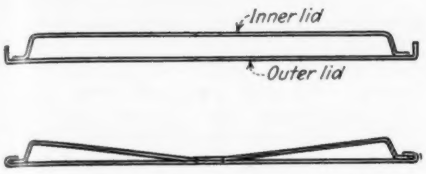


Fig. 3—Final step in forming inner lid

steel block (identical blocks are used with the jigs employed in forming the top) serves to hold the jig in a vise while the plate is being formed. In forming the bottom, a $\frac{1}{16}$-in. steel sheet $9\frac{3}{4}$ in. in diameter is placed between plates A and B, which are locked together with a $\frac{1}{2}$-in. machine bolt. The protruding edges of the sheet are then hammered down, as in Fig. 2.

The top part of the lid, which is combined with the inner part, as in Fig. 5, is formed in a substantially similar manner, only using a $\frac{1}{16}$-in. sheet 10 in. in diameter and a $\frac{1}{2}$-in. forming plate $9\frac{5}{16}$ in. in diameter. In forming the inner part of the lid, which is made of a $\frac{1}{16}$-in. sheet $9\frac{1}{2}$ in. in diameter, the first operation is the same, using a $\frac{5}{8}$-in. forming plate $8\frac{3}{16}$ in. in diameter. The $\frac{1}{2}$x$9\frac{5}{16}$-in. and $\frac{5}{8}$x$8\frac{3}{16}$-in. forming plates are then clamped together with the inner lid between them, as in Fig. 3. A 12x12-in. square plate (F) $\frac{3}{8}$ in. thick and with the center cut out, is then fitted over



Figs. 4 and 5—Inner and outer lids assembled, above; below, outer lid crimped over inner

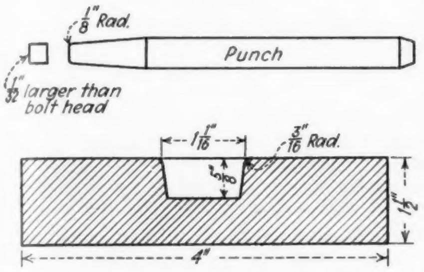


Fig. 6—Punch and die for bolt-head retainer

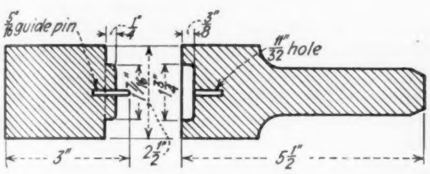


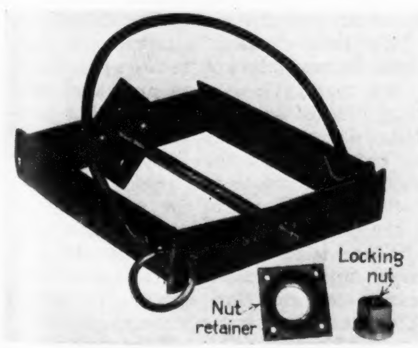
Fig. 7—Punch and die for nut retainer

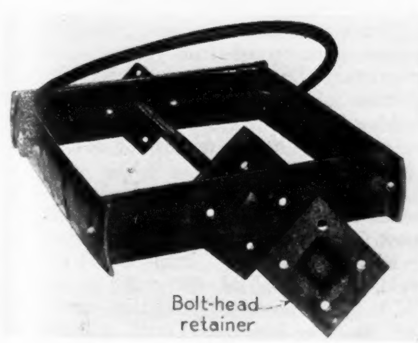
the flange of the inner lid, which is then turned down as shown. The inner and outer parts of the lid are then fitted together, as in Fig. 4, after which the outer lid is crimped over the edge of the inner lid, as in Fig. 5.

Other major parts of the bucket are a $\frac{1}{2}$-in. machine bolt $10\frac{1}{2}$ in. long, steel locking nut, bolt head and nut retainers, handle and steel retaining ring for holding the lid on the bucket. The locking nut is made from $1\frac{1}{4}$-in. round cold-rolled steel. This piece of steel is turned down to a diameter of 1 in. for a distance of $\frac{3}{4}$ in. (total length is 1 in.), after which it is drilled $\frac{13}{32}$ in. and threaded with a $\frac{1}{2}$-in. standard thread. The final operation consists of squaring the nut for a distance of $\frac{5}{8}$ in. (Fig. 8).

In forming the bolt head retainer, which is made of a 3x3-in. piece of steel $\frac{1}{8}$ in. thick, the punch and die shown in Fig. 6 are employed. The punch is first made large enough to form the $1\frac{1}{16}$x$1\frac{1}{16}$-in. recess in the $1\frac{1}{2}$x3x4-in. mild-steel die block, after which the punch is ground to $\frac{15}{16}$x$\frac{15}{16}$ in. To avoid cutting the steel being formed, edges of the punch are rounded off on a $\frac{1}{8}$-in. radius. Edges of the die recess are rounded to a radius of $\frac{3}{16}$ in. The nut retainer is formed with the punch and die shown in Fig. 7. The $\frac{1}{8}$x3x3-in. plate from which the retainer is made is first drilled with a $\frac{5}{16}$-in. hole to accommodate the guide pin. Later, this hole is drilled out to $1\frac{11}{32}$ in., after which the retainer is trimmed to $2\frac{1}{4}$x$2\frac{1}{4}$ in.

Fig. 8 — Cut-out section of complete bit bucket, showing construction





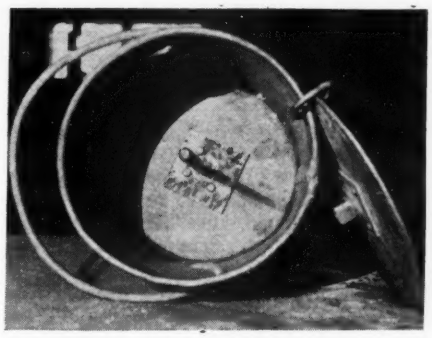


Fig. 9—Completed bit bucket

In assembling the bucket, the bottom is placed and four or five holes for $\frac{3}{16}$x$\frac{1}{2}$-in. rivets are drilled through both side and bottom flange. After riveting, $\frac{3}{16}$ in. of the side is crimped over the bottom flange, as in Fig. 8. The top edge of the bucket is then rolled down over a $\frac{3}{16}$-in. stiffening wire. The $\frac{1}{2}$x$10\frac{1}{2}$-in. machine bolt is then inserted in the hole in the bottom plate and marked off $\frac{5}{8}$ in. above the top. The bolt is then cut off and standard threads are turned on the $\frac{5}{8}$-in. section, after which it is replaced. A third $\frac{1}{8}$x3x3-in. piece drilled with a $\frac{1}{2}$-in. hole is then slipped over the bolt. This is followed by a length of $\frac{3}{4}$-in. pipe and a nut. The nut is screwed down to tighten the $\frac{1}{8}$x3x3-in. plate against the bottom, after which the bucket is turned upside down and the bolt-head retainer placed. Four $\frac{1}{4}$-in. holes are then drilled through retainer, bottom and plate for $\frac{1}{4}$x$\frac{5}{8}$-in. rivets.

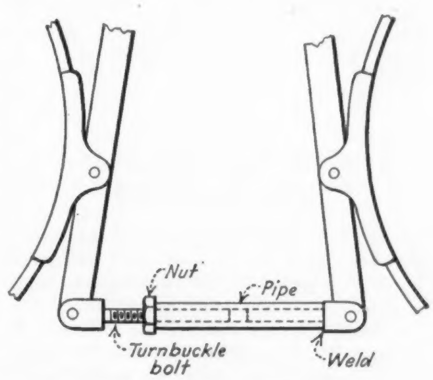
The next operation is punching two $\frac{7}{16}$-in. holes on opposite sides of the bucket $1\frac{1}{2}$ in. down from the top to accommodate the bail, which is made of $\frac{3}{8}$-in. round rod. The holes are punched from the inside and the metal is hammered down to form a shoulder. The locking nut in retainer is then placed on the lid, and the nut run down tight on a $\frac{1}{2}$x1-in. machine bolt. Holes $\frac{3}{16}$ in. in diameter are then drilled in the four corners of the retainer through the inner and outer lid and rivets put in. The $\frac{1}{2}$x1-in. bolt is then removed and the $\frac{1}{2}$-in. holes in the inner and outer lids are redrilled to $\frac{9}{16}$ in. to allow easy engagement of the nut and bolt when screwing the lid down.

A $\frac{3}{8}$-in. hole then is drilled through the inner and outer lids $\frac{3}{4}$ in. from the edge, and a similar hole is drilled in the side of the bucket $\frac{3}{4}$ in. down from the top. The top is then screwed down with the two holes in line, after which a lid-retaining ring with an inside diameter of $1\frac{1}{2}$ in. is threaded through the holes and welded shut. Capacity of the bucket can be increased by using a wider side sheet, which increases the height, and a longer bolt.

Adjusting Brakes Made Easy By Improving Rigging

To eliminate brake-tightening difficulties arising out of the accumulation of sand and dirt in the threads of the turnbuckle bolts, the alternative arrangement shown in the accompanying sketch was developed at the No. 3 mine of the National Mining Co., writes W. G. Hageter, Meadowlands, Pa. In this arrangement, the turnbuckle bolts were retained, but the turnbuckle itself was replaced by a piece of pipe of the proper length just large enough to admit the turnbuckle bolts. One end of the pipe was solidly welded to the shoulder of the yoke carrying one of the turnbuckle bolts. The other turnbuckle bolt, however, was left free to move in the pipe, and was fitted with a nut which, bearing against the end of the pipe, permits adjustment of the brakes.

To assure easy movement of the nut over a long period of time, a quantity of cup grease was applied both to the exposed portion of the threads and inside the pipe.



Pipe and adjusting nut applied to brake rigging

Completing the job, a piece of brattice cloth was wrapped tightly around the assembly as seal against sand, dirt and water. The first installation went into service in May, Mr. Hageter states, and to date making a brake adjustment has involved no more than turning the nut by hand.

WORD FROM THE FIELD

Preparation Problems to Fore In Coal Division Meeting

Preparation will be an important feature on the program of the two-day fall meeting of the Coal Division of the A.I.M.E., to be held at the Coronado Hotel, St. Louis, Mo., Oct. 28-29. The following papers will be presented and discussed:

"The Future of Coal for Railway Fuel," Eugene McAuliffe, president, Union Pacific Coal Co.; "The Future of Coal for Stationary Power," E. H. Tenney, chief engineer of power plants, Union Electric Light & Power Co.; "Preparation, Selection and Burning of Bituminous Coal for Steam Generation," E. G. Bailey, vice-president, Babcock & Wilcox Co.; "Importance of Pulp Density, Particle Size and Feed Regulation in Flotation of Coal," John T. Crawford, preparation department, Pittsburgh Coal Co.; "Value of Coals as Steaming Fuel, as Indicated by Their Chemical and Physical Properties," Henry Kreisinger, research engineer, Combustion Engineering Co., Inc.; "The Coal Basin West of the Mississippi River," C. M. Young, professor of mining engineering, University of Kansas; "Economic and Competitive Position of Illinois Coal," Walter H. Voskuil, mineral economist, Illinois Geological Survey; "Current Practice in Coal Preparation in Illinois," H. F. Hebley, Allen & Garcia Co.

Local arrangements are in charge of the following committee: M. M. Leighton, director, Illinois Geological Survey, chairman; Carl G. Stifel, president, Pocahontas Mining Co.; Henry F. Hebley, Allen & Garcia Co.; Paul Weir, vice-president, Bell & Zoller Coal & Mining Co.; F. W. DeWolf, head, department of geology, University of Illinois; and A. C. Callen, head, mining engineering department, University of Illinois.

Virginia Virgin Coal Land To Be Developed

Preparations to develop an extensive area of virgin coal land in Buchanan County, Virginia, are well under way with the granting of authority by the Interstate Commerce Commission to the Norfolk & Western Ry. to extend its lines 38½ miles from Grundy, Va., into the undeveloped territory. Rights of way have been obtained up Levisa Fork to the mouth of Garden Creek and thence up Dismal Creek to Knob Branch. To construct the extension the N. & W. proposes to expend about $3,500,000.

The railroad company estimates that the territory to be tapped contains about four hundred million tons of coal. Most of the land to be affected by the new line is owned by the W. M. Ritter Lumber Co., C. L. Ritter Lumber Co., Big Vein Pocahontas Coal Co. and the Harman interests, of Tazewell, Va. The only coal operations now in the vicinity of the new area are the mines of the Jewell Ridge Coal Corporation on Levisa Fork and in the southern part of Buchanan County. In granting authority to construct the rail line the I.C.C. stipulated that construction must begin within six months and be completed within 2½ years. Grading in the vicinity of Grundy has been started, and the construction contract is soon to be awarded.

New Breaker for Clear Spring

A new steel fireproof breaker costing $200,000 is being constructed by the Sullivan Trail Coal Co. at West Pittston, Pa. Louis Pagnotti, president of the Pagnotti Coal Co., Old Forge, Pa., is president of the Sullivan Trail company, which is operating the old Clear Spring colliery, abandoned in 1911 after being flooded. One seam has been opened and is producing 400 tons per day. When the lower seam has been dewatered, which is now under way, it is expected that 1,000 tons daily will be mined.

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WIDENS ELIGIBILITY LIST

COAL CUTTERS, loading machines and conveyors, electric mine locomotives, rock-dusting machines and ventilation tubes and blowers have been added to the list of mining equipment which is eligible for loans under the amended National Housing Act (*Coal Age*, September, 1935, p. 389). Definite ruling on these items, which originally were on the "pending list," was announced by the Federal Housing Administration at Washington last month.

Under the modernization credit plan authorized by the amended law, banks may make loans up to $50,000, repayable in monthly installments over a period of five years, for additions to and improvements in properties already in operation. FHA will insure such loans up to 20 per cent of their face value. In addition, bank examiners have specific instructions that such loans are not to be classed as "slow" in their appraisal of the bank portfolios.

Government Agrees to TVA Test In Supreme Court

A prompt hearing by the U. S. Supreme Court on the constitutionality of the power policy of TVA was agreed to by the government on Sept. 17. A memorandum filed with the court by Solicitor General Reed and TVA counsel concurred in the plan for a quick review of the ruling of the Circuit Court of Appeals on July 17 at New Orleans, La., which held TVA constitutional and approved its sale of surplus power in Alabama (August *Coal Age*, p. 348). This was a reversal of the decision of Judge W. I. Grubb, in the U. S. District Court of northern Alabama.

The review by the Supreme Court is sought by fourteen minority stockholders of the Alabama Power Co. who challenge the right of TVA to sell surplus power generated at Wilson Dam and to purchase the power company's transmission lines emanating from Wilson Dam. Although the government did not oppose the petition for a review, it did raise the question of the right of minority stockholders to bring the suit without showing fraud or damage. The Supreme Court term will open Oct. 7.

In its brief the government defended its right to buy transmission lines and sell surplus power, asserting:

"The suggestion of petitioners that the right of disposition enjoyed by the federal government does not include all the power created by the dam but is limited to such power as is created by waters manipulated for navigation alone, is a limitation nowhere suggested in the cases and obviously inconsistent with any real power disposition.

"We believe these issues have been settled by an unbroken series of decisions of this court. These cases are based upon recognition of the physical fact that navigation dams inevitably create power, and the economic fact that disposal of that power avoids waste and tends to produce revenues which aid in the reimbursement of the costs of navigation improvements.

"There is no force in petitioners' contention that the generation, sale and transmission of electrical energy constitutes 'proprietary business' commercial in character, and therefore beyond the permissible functions of the federal government.

"The Constitution no more prohibits the federal government from engaging in a proprietary business than it forbids the creation of a corporation to conduct a banking business; neither is an end in itself but each may be the means for reaching a legitimate end."

A statement issued by the U. S. Department of Justice said: "In not opposing request for a writ of certiorari to review the decision of the Fifth Circuit Court of Appeals, which upheld the validity of the TVA, the government feels that consideration by the Supreme Court will set at

rest doubts expressed on constitutional grounds as to the right of the TVA to carry out phases of its power program as required by a mandate of Congress."

TVA announced Sept. 24 that plans were under way for construction of a 250-mile transmission loop linking eight municipalities in west Tennessee with TVA power. The cities already own distribution systems. TVA will spend more than $1,000,000 to build the line. The system will link Boliver, Covington, Dyersburg, Jackson, Milan, Somerville, Trenton and Union City. Jackson will receive TVA power for municipal purposes only.

The Birmingham (Ala.) Electric Co. applied to the District of Columbia Supreme Court on Sept. 17 for a permanent injunction to restrain the PWA from allocating $1,238,182 to Bessemer, Ala., for erection of a distributing system and electric transmission line connecting with the TVA plant, 50 miles distant. The petition argues that the company will lose its investment if the loan is granted and that the plaintiff's rights under the Constitution will be violated through deprivation of property.

A preliminary injunction forbidding PWA to lend money to cities to build their own power plants was issued Aug. 28 by Judge Jesse Adkins in the District of Columbia Supreme Court. The Kansas Utilities Co. and the Texas Utilities Co. applied for the injunction following reports that PWA was preparing to make loans to Burlington, Kan., and Plainview, Texas, for construction of municipal power plants. A few weeks previous, the U. S. Circuit Court of Appeals at St. Louis, Mo., ruled that the federal government exceeded its constitutional powers in granting funds to Kennett, Mo., to build its own plant.

PWA officials professed to be unconcerned about the latest decision, pointing out that it was only a preliminary injunction and that the real issue would not be decided until arguments are heard and the court considers permanent action. PWA will continue to receive and act upon municipal applications, it was said, until the Supreme Court has passed on the issue. Administrator Harold L. Ickes has set up a special board to expedite power projects.

Lillybrook Company Expands

Development work is proceeding steadily on a new operation of the Lillybrook Coal Co. that will be one of the largest in the Winding Gulf field, according to T. H. Wickham, president of the company. The new mine will produce coal from the Pocahontas No. 3 seam through a slope opening at Lego. A modern steel tipple will displace an old structure to clean and prepare coal in six sizes. The operation is to have a capacity of 60,000 tons monthly.

Coal rights controlled by the company in the Pocahontas No. 3 seam cover seven thousand acres and, as the company has sufficient reserves in the Fire Creek seam, which it has been operating, to maintain the present output for a number of years, the new operation will double its capacity. Organized in 1915, the company purchased the property at Lego several years ago with the latest development in mind.

Constitutionality of New Coal-Control Act Challenged in Two Federal Courts

ALTHOUGH the Guffey-Snyder coal-control bill weathered its first court test, between the signing of the bill on Aug. 30 and the naming of the National Bituminous Coal Commission and the Bituminous coal Labor Board on Sept. 20, its most severe ordeal is still to be faced. In the District of Columbia Supreme Court on Sept. 16, Justice Daniel O'Donoghue denied as "premature" a request for a temporary injunction, intended to restrain the effectiveness of the act, sought by James W. Carter, president, Carter Coal Co., operating in southern West Virginia. Three days later, in an action by C. H. Clark, a stockholder in the R. C. Tway Coal Co., for an injunction requiring the Tway company to join the code provided for in the Guffey bill, the stage was set, by legal strategy, for a constitutional test of the act in the federal District Court at Louisville, Ky., on Sept. 27. The Tway company joined fifteen other Kentucky coal companies in attacking the validity of the act.

Mr. Carter filed suit to test the law within 24 hours after the President signed it. Frederick H. Wood, attorney for the plaintiff in the Schechter poultry case, which resulted in the nullification of NIRA, who represented Mr. Carter, set forth in his complaint that the Carter Coal Co. intended to comply with the Guffey law and become a member of the code provided for therein, although its officers and directors believed that it would result in serious damage to its business. The only reason for code compliance, it was said, was that the 15 per cent gross excise tax imposed on non-code members would ruin the corporation's business and force it into bankruptcy.

Charging that the Guffey act is unconstitutional in attempting government regulation of intrastate commerce by exacting or withholding a heavy penalty, called a tax, the plaintiff asked that the Carter company be restrained from giving its assent to the provisions of the act and that the court restrain the government officials charged with the duty of collecting the tax from enforcing the act against the company. It also is alleged that the act cannot be sustained under the commerce clause, as its regulations as applied to the Carter company cover wholly intrastate business. Violation of the Tenth Amendment to the Constitution is charged against the act in that it constitutes an invasion by the federal government of the field of regulation reserved by that amendment to the States or to the people. The complaint also contends that the act violates the Fifth Amendment in attempting to deprive the plaintiff, without due process of law, of the liberty guaranteed to it by that amendment; would deprive the company of its property rights, including existing contracts, and attempts to take the private property of the company for public use without just compensation. The final charge in the summarized bill of complaint was that the act "is wholly arbitrary, capricious and unequal."

No Decision on Constitutionality

In refusing to grant a temporary injunction, Justice O'Donoghue did not pass on the constitutionality of the act. His ruling was in conformity with the argument of John Dickinson, Assistant Attorney General, who, in presenting the government's case, said the petition for an injunction was premature. The tax provision, Mr. Dickinson pointed out, will not be effective before Nov. 1, nor until the Coal Commission was set up and a code promulgated.

Mr. Wood, in his argument for the plaintiff, said: "The federal government cannot regulate the way things may be produced, whether on the farm in the mines or in the factories." If Congress can fix prices at which coal can be sold, he contended, "it can fix the price for every product sold in interstate commerce. . . . Congress, obviously mindful that this law is in excess of its power to regulate commerce, did not enact it as a regulatory statute. It sought while setting up a code, voluntary on its face, to coerce all operators into it by imposing a 15 per cent tax on the gross sale price at the mine, permitting a drawback of 90 per cent of the tax by those abiding by the code." He argued that the government admitted the truth of the Carter company's allegations as to unconstitutionality of the Guffey act by its "silence" in an answer which stated merely that the action was premature.

Foreshadowing his ruling, Justice O'Donoghue asked Mr. Wood how the plaintiff could show loss before the code had become effective. "It may be shown that these regulations benefit coal-company stockholders," he added. The court also questioned his authority to enjoin the possible imposition of a tax on a corporation when the tax has not been imposed. "This company may sell out or go out of business before Nov. 1," he remarked."

Denial of the request for an injunction was made without prejudice against a

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BITUMINOUS LABOR BOARD NAMED

THE PRESIDENT appointed the following to membership on the Bituminous Coal Labor Board on Sept. 20:

LEE C. GUNTER, Knoxville, Tenn., named as producer representative, is executive vice-president of the Southern Appalachian Coal Operators' Association. He formerly owned and operated four coal mines in eastern Tennessee. He also was at one time in the construction business, building bridges, railroads, etc.

JOHN J. O'LEARY, Pittsburgh, Pa., labor representative, is a member of the international executive board of the United Mine Workers, representing District 5. He has held that post since 1917.

JOHN M. PARIS, New Albany, Ind., is an attorney and has served as a judge for more than twenty years in Indiana. As the representative of the public he automatically becomes chairman of the board.

future move by counsel for the Carter company for such an order if positive proof of threatened injury should become available. The court suggested to Mr. Wood that a motion to advance the case for final hearing might be made at any time, with a decision possible late this year or early in 1936.

The Tway Coal Co. case had its inception Sept. 10, when sixteen coal companies operating mines in Harlan County, Kentucky, filed suit in the U. S. Court for the Western District of Kentucky against Selden R. Glenn, both personally and officially as collector of internal revenue for the Kentucky district. The plaintiffs alleged that the Guffey act was unconstitutional on five points, declared they would refuse to obey it and asked for an injunction forbidding its enforcement.

Former federal Judge Charles I. Dawson, who adjudged the NRA unconstitutional before leaving the bench to resume private practice, filed the action as counsel for the sixteen Harlan County companies. He alleged also that the Guffey act violated the Fifth and Tenth amendments of the Constitution, and charged that it attempted to delegate legislative power. In addition, he argued that the section levying a 15 per cent tax on all coal production, with 90 per cent refund to compliers, is "an unconstitutional attempt on the part of Congress, under the guise of taxation, to punish those producers of bituminous coal who are unwilling to surrender their constitutional rights."

Attacks Price Fixing

The complaint specifically condemned as beyond the power of Congress the provision for fixing maximum and minimum prices; the requirement that producers sell to all customers similarly circumstanced at the same price; the declaring invalid of contracts previously made which conflict with the Guffey act and the limiting of contracts made before the code is completed to 30 days' duration; the regulation of labor-employer relations and the fixing of wages and hours.

The sixteen companies declared that none of them intended to accept the code or submit to the commission provided by the act, but that each intended to exercise its consitutional right to conduct its business of producing and selling coal, which business is a private one and not affected with a public interest, the declaration of Congress to the contrary notwithstanding. The plaintiffs petitioned for a judgment of unconstitutionality against the act, for a similar declaration specifically against Sec. 4 (providing for the code) and the tax levying and refunding sections, and for an injunction against collection of the taxes.

The following companies, in addition to the Tway company, were the plaintiffs: Harlan Central Coal Co.; Harlan Fuel Co., Crummies Creek Coal Co., Three Point Coal Co., Clover Fork Coal Co., Harlan Collieries Co., High Splint Coal Co., Cornett-Lewis Coal Co., Green-Silvers Coal Corporation, Kentucky King Coal Co., Kentucky Cardinal Coal Corporation, Mary Helen Coal Corporation, Harlan-Wallins Coal Corporation, P. V. & K. Coal Co. and Creech Coal Co.

Legal strategy made its appearance two days later when Mr. Clark, a director of the Tway company, one of the sixteen suing companies, filed a complaint in the same court seeking a decree that it is the duty of the Tway company to accept the code and operate under its provisions. His petition defended the right of Congress to regulate the production of coal and impose the tax of 15 per cent on the sale price at the mines of companies refusing to comply. Unless the Tway Company complied with the act, Mr. Clark contended, it would be subject to disastrous loss which would lead to bankruptcy, and be subject to a fine of $10,000.

Judge Dawson, for the Tway company, filed a motion Sept. 19 to dismiss Mr. Clark's action on the ground that the Guffey act was unconstitutional, making practically the same objections that he offered in the suit against the revenue collector. With his motion for dismissal, however, he filed an agreement of counsel and parties in the case in which both sides agreed that if the Guffey bill was valid, Mr. Clark ought to have his injunction, for refusal of the directors to sign the code would cause such penalties as to be tantamount to their ruining the company. But if the act was invalid, the stockholder's case ought to be dismissed, on the theory that the company ought not to be forced to obey an invalid statute. Finally, it was agreed that Mr. Clark's counsel might invite the government to help adduce constitutionality of the law, but government counsel must not take control of the case or delay it.

With a hearing set for Sept. 27 Judge Dawson indicated that he would press for a constitutional ruling whether or not the government came into the case. He pointed out that the government was no party to the Clark case, but was merely being invited to defend its law. To make this easier, he said, he would consent to the suit against the revenue collector being heard with the Clark case, and the government may present its entire case if it wishes.

BITUMINOUS COAL COMMISSION APPOINTED BY PRESIDENT

PRESIDENT ROOSEVELT named the National Bituminous Coal Commission, under the provisions of the Guffey-Snyder coal-control act, on Sept. 20. The appointees are as follows:

CHARLES F. HOSFORD, JR., Pittsburgh, Pa., who was born in 1887 and graduated from Princeton in 1908 and Harvard Law School in 1911. He began the practice of law at Butler, Pa., in 1911, becoming interested in several coal mines in Butler County in 1916. In 1923 he became president and general manager of the Butler Consolidated Coal Co., serving in 1931 as a member of the Bituminous Coal Commission named by Governor Pinchot. A supporter of federal regulation of coal for several years, he was a member of the Code Authority for Western Pennsylvania, becoming manager in 1934, when he disposed of his coal interests. He also had been a director of the Coal Control Association of Western Pennsylvania.

C. E. SMITH, newspaper editor, of Fairmont, W. Va., was born there in 1885, was graduated from Virginia Military Institute and studied at the University of West Virginia. He began newspaper work in 1907 and has been editor of the Fairmont *Times* since 1917. From 1920 until 1923 he was president of the Big Four Coal Co.

PERCY TETLOW, Columbus, Ohio, is president of District 6, United Mine Workers, as well as commissioner of arbitration in the Kansas field. He was in the Spanish-American War and was a captain of machine gunners in the World War. He was a member of the Ohio Legislature for some years, was a member of the Ohio fourth constitutional convention in 1912, and first Director of Industrial Relations of that State, 1921-22.

WALTER H. MALONEY, Kansas City, Mo., is a well-known attorney in that city. GEORGE E. ACRET is a successful attorney practicing in California.

Oklahoma Fields Mapped

Maps of the Lehigh, McAlester, Wilburton, Howe and Stigler-Poteau districts in the southeastern Oklahoma coal field have recently been published in a small advance edition by the U. S. Geological Survey. These maps are based upon field investigations made from 1927 to 1935 by T. A. Hendricks, W. T. Thom, Jr., and M. M. Knechtel, of the Survey staff, and show the outcrops of the various coal beds, location of mines, all mine workings for which information is available, areas of segregated Indian coal lands, and the features of the geologic structure of the rocks associated with the coal beds. Nine beds of workable thickness are present in these five districts, but two of these beds have been developed only locally. Copies of the maps may be purchased from the director of the Survey, Washington, D. C., at $1 each or $4 for the set of five.

Would Eliminate Surcharge

Urging that elimination of the 10c. surcharge on coal was essential to meet truck competition, the Pennsylvania, Pittsburgh & Lake Erie and Baltimore & Ohio railroads made application on Sept. 19 to the Interstate Commerce Commission for permission to drop the charge on coal moving from Colona and Conway, Pa., to Youngstown, Ohio. The surcharge was applied by order of the ICC Dec. 5, 1933.

Stoker Sales Continue to Rise

Sales of mechanical coal-burning stokers in July, 1935, totaled 3,353, of which 2,868 were small residential-size units, according to statistics furnished the U. S. Bureau of Census by 108 manufacturers. This compares with sales of 2,826 units in the preceding month and 1,689 in July, 1934. Figures for the first seven months of 1935 show that 13,589 units of all sizes and types

were sold, compared with 7,874 in the corresponding period of 1934. Sales by classes in the first seven months of this year were as follows: Residential (under 100 lb. of coal per hour), 11,362; apartment house and small commercial heating jobs (100 to 200 lb. per hour), 876; general commercial heating and small high-pressure steam plants (200 to 300 lb. per hour), 371; large commercial and high-pressure steam plants (over 300 lb. per hour), 980.

Personal Notes

Charles L. Albright has been appointed secretary of the H. C. Frick Coke Co. and seven other affiliates of the United States Steel Corporation, succeeding the late William Gates. Mr. Albright became affiliated with the Frick company 30 years ago. William J. Brady succeeds Mr. Albright as assistant secretary.

Dr. Thomas S. Baker, retired Sept. 17 as president of Carnegie Institute of Technology, Pittsburgh, Pa., due to illness of more than a year. In accepting his resignation, the board of trustees appointed him president emeritus and unanimously nominated him for membership on the board. Under his régime many departments of the institution were organized or extended, especially the coal research and metals research laboratories. He organized the three international coal conferences, in 1926, 1928 and 1931, which attracted to the institute thousands of scientists and business men from America and Europe.

J. B. Clifton, president and general manager of the Lillybrook and Raven Red Ash coal companies and Raleigh Smokeless Fuel Co., of West Virginia, has disposed of his interests in those companies to his associates, T. R. Ragland, E. S. Pugh, F. L. Conway and J. A. Hunt, effective Sept. 1. Ill health was given as the cause of Mr. Clifton's retirement.

T. E. Costner, formerly superintendent of Lewisburg Nos. 1 and 2 coal mines of the Sloss Sheffield Steel & Iron Co., Jefferson County, Alabama, has been appointed division superintendent of mines of that company. He has been succeeded as superintendent of the Lewisburg operations by G. W. Chandler, promoted from mine foreman.

Dr. Thomas S. Baker

C. D. Craddock, president of the National Coal Co., Salt Lake City, Utah, has resigned that post to enter the fur business. He formerly was general sales manager and later temporarily general manager of the Utah Fuel Co., Salt Lake City. A. R. Barnes, vice-president of the National and formerly Attorney General of Utah, succeeds Mr. Craddock as head of the company. F. A. Sweet, Jr., is the new vice-president, and H. H. Elkin, formerly with the Safety Mining Co., has succeeded D. C. McAlpine as mine superintendent.

Charles Enzian, who has had a long and distinguished career as a coal mining engineer, has been appointed a member of the new State board of examiners which will conduct examinations of applicants for appointment as anthracite mine inspectors in Pennsylvania. He succeeds Harry W. Montz, mining engineer of the Lehigh Valley Coal Co. Other appointees to the board are: Charles H. Strange, consulting mining engineer, Pottsville; who succeeds Cadwallader Evans, Jr., vice-president and general manager, Hudson Coal Co.; Joseph Donnelly, Shamokin miner, who succeeds John Skelding, Mount Carmel; Cornelius McLaughlin, miner, of West Hazleton, who takes the place of Frank Keast, Coaldale; and Augustine McGuire, Scranton, who replaces David L. Parry, Carbondale, deceased.

Robert B. Hager has been appointed Eastern manager of the Red Jacket Coal Co., Columbus, Ohio, with offices at 2568 Park Ave., New York City. Until recently he was affiliated with the New York office of the Carter Coal Co.

J. M. Mull has been appointed general superintendent of mines of the Woodward Iron Co., vice M. Heard, resigned. F. C. Bobham, mine foreman at Mulga colliery, has been appointed superintendent of that operation.

T. J. O'Brien, Kemmerer Coal Co., was elected president of the Southern Wyoming Coal Operators' Association at the annual meeting, held late in August in Rock Springs. Other officers elected are: vice-president, Forrest Richardson, Sheridan Coal Co.; treasurer and executive secretary, L. W. Mitchell (reelected). The association voted unanimously to change its headquarters from Rock Springs to Cheyenne.

Erskine Ramsay, chairman of the board, Alabama By-Products Corporation, has been appointed by Harper Sibley, president of the United States Chamber of Commerce, to membership on a special committee which is to study the feasibility of railroad consolidations and related problems affecting rail lines. Mr. Ramsay has accepted the assignment.

N. P. Rhinehart, chief of the West Virginia Department of Mines has announced the following reassignments of mine inspectors: Kenna Gentry, from Logan County to Gauley Bridge; R. L. Jenkins, from Boone to Logan County; C. M. Meadows, promoted from assistant safety director to inspector of Boone County; William Moore, to the Panhandle district, replacing H. E. Taylor, temporarily in charge; William Sandridge, from Grafton to Buckhannon; C. L. Milligan, from the Third District, including Clay and Webster counties, to Kanawha County; and John Kyle, from Kanawha County, to Thomas, Tucker County.

R. E. Salvati

R. E. Salvati, for the last few months acting general manager of the Island Creek Coal Co., was appointed general manager of the company on Sept. 24, with general offices at Holden, W. Va. He also will continue as vice-president and general manager of the Pond Creek Pocahontas Co.

Thomas R. Stockett, vice-president and general manager of the Spring Canyon and Royal coal companies, with operations in Utah, has relinquished those positions. He is retiring, after about fifty years' association with the coal industry. James B. Smith, president of the above-named companies, with whom Mr. Stockett has been associated for the last thirty years, will also take over the duties of general manager of both companies.

Darius A. Thomas, president, Montevallo Coal Mining Co., and chairman of the advisory committee of Alabama coal operators, has been named chairman of the industrial committee of the Birmingham Chamber of Commerce, vice Paul A. Ivy, deceased. Mr. Thomas served several terms as president of the chamber.

T. H. Wickham has been elected president of the Lillybrook Coal Co., Beckley, W. Va., vice J. B. Clifton, resigned.

Natural Gas Line for Detroit

In the face of strong opposition by coal producers, the Detroit City Gas Co. signed a fifteen-year contract late in August with the Panhandle Eastern Pipe Line Co. to supply natural gas to Detroit beginning July 1, 1936. The Panhandle company is controlled jointly by the Columbia Gas & Electric Co. and the Missouri-Kansas Pipe Line Co.

The project calls for the construction of

a 300-mile pipe line from Rockville, Ind., to Detroit, costing $9,000,000; expenditure of $9,000,000 more for strengthening the present pipe line from Rockville to the Texas gas fields, and an outlay of $2,500,000 by the Detroit gas company in order to fit its distribution facilities for natural gas. The contract is reported to be subject to the pipe line company's ability to finance construction of the line by Jan. 1 next.

New Preparation Facilities

New contracts and construction of preparation facilities were reported as follows in September:

CENTRALIA COLLIERIES Co., Centralia, Pa.: contract closed with the Wilmot Engineering Co. for two Hydrotators with dewatering screens, pumps, etc., for preparing rice and barley.

PITTSBURG & MIDWAY COAL MINING Co., West Mineral, Kan.: contract closed with the Deister Concentrator Co. for four Deister-Overstrom "Diagonal-Deck" coal-washing tables for installation in supplementary cleaning plant for ⅛-in. x 35-mesh coal; capacity, 15 tons per hour; to be installed Sept. 15.

WOLFE COLLIERIES Co., Oneida, Pa.: contract closed with the Wilmot Engineering Co. for complete breaker to prepare 1,200 tons of anthracite per day. Equipment includes Simplex Type D jigs for prepared sizes and Hydrotator for rice and barley, Parrish shaker screens and Wilmot crushing rolls. The installation, to be completed by Nov. 15, includes a precleaner for primary screening, crushing and preliminary preparation.

First-Aid Meets Held

In the annual safety meet of the New River and Winding Gulf Mining Institute, held Sept. 14 at Mount Hope, W. Va., the Sprague team of the New River Co. won the first-aid contest with a perfect score. Second place was captured by the Winding Gulf team of the Winding Gulf Collieries Co., and the Cranberry Fuel Co. team was third. In the division for colored teams, first place went to the Price Hill team, wth a perfect score; second, Raleigh Coal & Coke Co. team.

The tenth annual safety meet of the Coal River Mining Institute was held Aug. 31 at Whitesville, W. Va. The first-aid contest for white men's teams was won by the Eunice team of the Chesapeake & Ohio Ry., which received a silver trophy donated by the National Coal Association. The Elkhorn Piney Coal Mining Co. team from Wharton, W. Va., was second, and the Nellis Coal Corporation men, Nellis, W. Va., were third. Teams in the colored division finished as follows: Boone County Coal Corporation, Sharples, W. Va., first; American Eagle Colliery Co., Ameagle, W. Va., second.

Teams representing the Beech Bottom mine of the Windsor Power House Coal Co., Power, W. Va., took first honors in both the white and colored divisions at the eighth annual Panhandle First-Aid Meet, held at Moundsville, W. Va., Sept. 2, under the sponsorship of the Panhandle Mining Institute. Second and third places in the white division went to teams representing the Hitchman Coal & Coke Co., Benwood, W. Va., and the Dartnell mine of the Elm Grove Mining Co., Elm Grove, W. Va.

In the Eastern Kentucky first-aid and mine rescue contest, held at Stearns, Ky., Sept. 14, the Inland Steel Co. team from mines Nos. 1 and 2 captured the silver trophy awarded by the National Coal Association to the winner in combination first aid and mine rescue. Other winners were: Mine rescue—Consolidation Coal Co., Mines 204 and 207, Jenkins, first; Inland Steel Co., mines 1 and 2, Wheelwright, second. First aid, Big Sandy district—Consolidation Coal Co., Van Lear; Cumberland River district—Stearns Coal & Lumber Co., Worley; Harlan district—Wisconsin Steel Co., Benham; Hazard district — Hardy-Burlingham Mining Co., Hardburly; State champions—Consolidation Coal Co., Van Lear, first; Consolidation Coal Co., mine 206, Jenkins, second; Hardy-Burlingham Mining Co., Hardburly, third; colored team—Inland Steel Co., Wheelwright.

Coming Meetings

• West Virginia Coal Mining Institute: annual meeting, Oct. 4-5, Beckley, W. Va.

• National Safety Council: 24th annual safety congress, Oct. 14-18, Louisville, Ky.

• Midwest Power Show: Oct. 14-18, Chicago, Ill.

• Coal Division of American Institute of Mining and Metallurgical Engineers: fall meeting, Oct. 28 and 29, St. Louis, Mo.

• Illinois Mining Institute; annual fall meeting, Nov. 8, Hotel Abraham Lincoln, Springfield, Ill.

• Harlan County Coal Operators Association: annual meeting Nov. 20, Harlan, Ky.

• Iowa Coal Operators Association: annual meeting, Dec. 10, Des Moines, Iowa.

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YARDSTICK FOR COAL?

A GOVERNMENT YARDSTICK for coal costs will be sought in Congress early in the next session, according to an announcement Sept. 20 by Representative Kent Keller, of Illinois. The Illinois Representative said he and other Congressmen from coal-producing States would urge enactment of a bill establishing a bituminous coal authority empowered to go into the business of producing coal along lines similar to those of TVA in producing power. The government's first experimental station, according to the tentative plan, would be in southern Illinois, with additional plants later in other fields where conditions differ.

Mine Power Plants May Escape Utility Holding Act

Each bituminous coal producing company operating its own generation, transmission or distribution system is advised by the National Coal Association to seek exemption from classification as a public utility under the Public Utility Holding Company Act of 1935 by application setting forth that the operation is only incidental to the main business and that the quantity of electric energy or gas sold to outside consumers is a small part of its total business. After such application is made, it is pointed out, the mining company is exempt from the requirements of the act pending a decision of the Securities and Exchange Commission upon the application. If the decision is favorable to the operator, the exemption will continue indefinitely or until revoked by the Commission.

This provision of the act is of particular importance to companies operating captive mines because of the relationship between the mining company and the parent corporation. Only by securing the exemption of the mining company from classification as a public utility company can the parent company escape the countless provisions of the act relating to holding companies, for if the mining company is a utility the company controlling it is a holding company within the meaning of the act.

The Commission is authorized to provide by a general rule for the exemption of any specified class of companies which it finds to satisfy the requirements given, the NCA bulletin says. If such exemption should be extended to mining companies as a class, the individual mining company would not need to file application for individual exemption. However, it is important to bear in mind that by filing such an application the company secures exemption until the Commission acts upon it.

"Profit Builder" Launched

Publication of a four-page paper called the *D&E Profit Builder*, which will appear monthly, was inaugurated in August. Published primarily for the benefit of dealers and salesmen for the product of Dickson & Eddy, anthracite producers, 17 Battery Place, New York, a front-page announcement states, the new publication "will deal with progressive reailing practices, successful sales methods, new sales ideas of current value, examples of effective dealer sales methods, and the practices and problems of dealers now effectively applying D&E's 'plus' value tonnage-building plan."

Adds Anthracite Stokers

Automatic anthracite stokers for household use have been added to the line of coal burners marketed by Link-Belt Co., Chicago and Philadelphia. The new equipment is available in three sizes having maximum feeds of 25, 35 and 50 lb. of coal per hour. Performance and operating economy, the company states, have been thoroughly checked on numerous installations in service for at least two heating seasons.

Mine Workers in Appalachian Field Quit Work While Conferees Seek Compromise

WASHINGTON, D. C., Sept. 24—When representatives of union miners and operators in the Appalachian coal field failed to reach an agreement on a wage contract by midnight, Sept. 22, union officials ordered the men to walk out. Response to the order was practically solid, even workers at captive mines complying. Only maintenance men remain at work, but there has been no disorder reported. Having receded from the original demand for an increase of 15c per ton in the wages of cutters and loaders, reducing it to 10c and then 9c, John L. Lewis, president, United Mine Workers, said at the conference today that the union had made its last concession. The producers had offered 6c officially and an unofficial offer of 6.9c was made, but Edward McGrady, Assistant Secretary of Labor, who has been trying to bring the stubborn factions together, indicated that the operators were willing to grant 7.5c. With this last narrow gap to bridge, union officials were optimistic over the prospects for an early settlement.

Although Mr. Lewis, in consenting to a fourth extension of the old agreement on July 26—to run until Sept. 16—said it would be the last, both sides agreed to a further extension to Sept. 22 when negotiations failed to bring results. Mr. McGrady arranged the fifth truce Sept. 15 after communicating with President Roosevelt by telephone to Hyde Park, N. Y. This was a compromise, the operators asking a two-week extension and the union demanding that any wage advances that might be agreed to be retroactive to Sept. 16.

Union Modifies Demands

At this session the union offered a modified proposal calling for continuation of the 7-hour day and 35-hour week; increase of 50c per day to all day and monthly men; increase of 10c per ton on combined cutting and loading rates, breakdown to be made in district conferences; increase of 10c per ton on pick-mining rates; increase of 15 per cent on yardage and deadwork rates; the same increase given to hand loaders to be given to men employed on machine loading and other mechanical devices and on stripping operations, to be worked out in district conferences; and a one-year contract to expire Sept. 16, 1936. This concession from the original union demands (March *Coal Age*, p. 135) was shouted down by the operators, who held out for a renewal of the existing scale until next April 1. A roar of disapproval from the miners followed, as well as a series of strike speeches. Patrick Fagan, president, District 5 (Pittsburgh, Pa.), U.M.W., said: "Every reasonable effort has been made to prevent a shutdown. The operators 'no' every proposal." An impassioned plea by Mr. McGrady to avert a stoppage, however, put an end to the speeches.

No substantial progress was made at the sessions during the next few days, which moved Mr. Lewis to scold the operators for following a "policy of sitting—and doing nothing and saying nothing." The sub-scale committee reported its inability to reach an agreement Sept. 20, and the report was passed on by the subscale committee to a meeting of the joint scale committee on Sunday morning, Sept. 22. When Mr. McGrady learned of the reported disagreement, he invited both sides to convene the full joint Appalachian wage conference to "explain to the public why they failed to reach an agreement."

The Sunday session lasted almost continuously until 3:30 a.m., Monday, with proposals and counterproposals from Philip Murray, vice-president, United Mine Workers, and Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., as spokesman for the operators. All were rejected, but concessions by both sides gradually brought them closer.

Mr. Murray reported the miners as agreeable to a wage agreement ending April 1, 1937, instead of Sept. 16, 1936. He also revealed that the operators had sounded out the miners on a 6.9c increase in the piecework rate and that the producers expressed willingness to pay an increase of 40c. for day work as well as an increase of 10 per cent for deadwork and 6c per ton in the cutting and loading rate. The union, said Mr. Murray, proposed that the difference of 3c. in piece rates be split in half, which would have amounted to a difference of $16,261 a day. When the operators balked, the committee deadlocked.

Agreeing that it was a question of $16,261 a day that kept the two sides apart, Mr. O'Neill declared that the operators had already conceded a wage increase of $169,000 a day. The producers' concessions, he said, gave the day workers a rise of 50c a day and pieceworkers an increase of 70c, these making the third substantial increase in wages in 24 months.

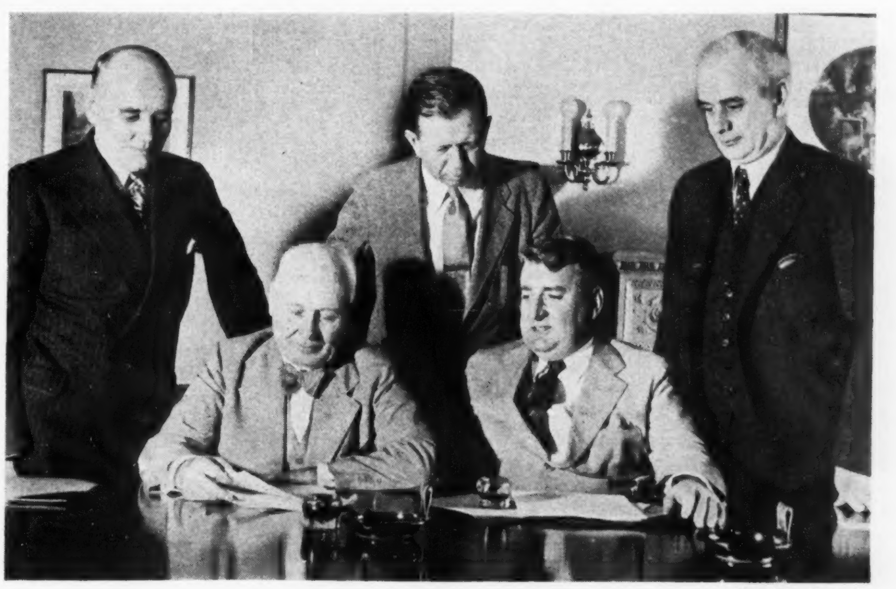
A resumption of negotiations at the behest of Mr. McGrady ending in a deadlock, Mr. Murray offered his "public explanation" of the failure to reach an agreement. In discussing wages, he said that an NRA study showed that 122,989 pieceworkers averaged $4.53 a day during the Dec. 1-15 period and that when deductions of 70c a day were made for powder and other supplies furnished by the miners their income averaged $685 a year. The wage increase of March, 1934, he said, raised the average wage to $806 a year. The present demand, he added, was for $935.50 a year.

In reply, Mr. O'Neill declared that wages had been increased at the rate of $125,000,000 a year for the last two years and that sales taxes, increased freight rates and other charges had added more millions to the operators' costs, so that they were now paying about $200,000,000 a year more to produce coal than they did two years ago. After declaring that wage increases in the last two years had made the average wage $5.75 for a 7-hour day he said that the operators were worried with the problem of paying existing wages and holding out against competitive sources of power. In connection with inroads by competitive fuels he said that in the last year 73,000,000 tons had been lost by the coal industry through more efficient methods of burning coal and 38,000,000 to oil.

Mr. O'Neill pointed out to Mr. McGrady that when the 1933 agreement was made it was a tripartite arrangement, with the government sitting in as the third party. At that time it was agreed, he said, that legislation would be passed by Congress regulating oil and natural gas, chief competitors of soft coal. "That promissory note of the government is still outstanding," he said, "and has been in default for two years."

With the passing of the zero hour of midnight on Sunday without an agreement, the order went out from union leaders to mine workers to quit work. At the earnest request of Mr. McGrady, however, the conferees agreed to resume negotiations in the afternoon of Sept. 23, but a four-hour session failed to break the deadlock.

After day and evening sessions today, an agreement seemed to be nearer than



Keystone View Co.

Wage Negotiators at Work

Left to right, seated—D. C. Kennedy, chairman, Appalachian joint wage conference; Charles O'Neill, representing Northern operators; standing—Van A. Bittner, president, district 17, U.M.W.; L. T. Putman, representing Southern operators; Philip Murray, vice-president, U.M.W.

at any other time thus far in the negotiations. All the major differences apparently had been ironed out except the rate for cutters and loaders. The opposing sides were said to be only 1.5c apart, Mr. Lewis giving notice, however, that "our last word is 9c a ton. They can take it or leave it."

The shutdown, according to reports by United Mine Workers headquarters, is 100 per cent effective in union areas, though many non-union workers continue to work. Van A. Bittner, president, District 17 (southern West Virginia), reported that 102,000 in his State were out. In the Pittsburgh (Pa.) district, P. T. Fagan, district president, said 50,000 had quit. Captive mines in western Pennsylvania and West Virginia also were idle. Estimates of the number of men who had walked out in other fields were as follows: Illinois, 25,000; Indiana, 8,500; Ohio, 30,000; Kentucky, 50,000; Maryland, 6,000; Virginia, 7,000; Alabama, 20,000; Arkansas-Oklahoma, 7,000. In eastern Tennessee and southeastern Kentucky, it was reported that about 10,000 were not working; in southern Tennessee and northern Georgia, 2,500; Kansas, 3,000; Iowa, 8,000; Montana, 1,600; Washington, 2,000.

As many mines in Colorado are normally closed on Monday, the number of men who would quit was not known, but Frank Hefferly, district president, U.M.W., said that as long as the order to quit stood "not a wheel would turn." The mines at Gallup, N. M., were reported working, but 700 miners at Raton and 300 at Dawson were said to have quit.

Mines continued in operation in Illinois where the Progressive union has contracts; at Dante and Clinchco, W. Va., where the Clinchfield Coal Corporation employs about 1,600 men; Dickenson County, West Virginia, where the Splashdam Coal Co. has a force of 200; the Harlan County (Ky.) field, and in western Kentucky, where an independent union has agreements with several companies.

West Virginia Institute to Study Important Problems

Operating and industrial relations problems will be among the problems discussed at the 28th annual meeting of the West Virginia Coal Mining Institute, to be held Oct. 4-5 at the Black Knight Country Club, Beckley, W. Va. At the technical session the following papers will be read:

"Securing Teamwork of Workers With Management at Coal Mines," Carel Robinson, general manager, Kelleys Creek Collieries Co.; "Possible Application of Mercury Arc Rectifiers to Mine Work," J. J. Linebaugh, General Electric Co.; "Conveyor Systems of Mining at Jewell Ridge Coal Corporation and Pemberton Coal & Coke Co.," E. B. Gellatly, manager, Jeffrey Manufacturing Co.; "Possibilities of an Industrial Relations Program in the Coal Industry," Fred A. Krafft, director employees' service, Consolidation Coal Co.; "Recent Developments in Explosives for Mines and Quarries," Sam Thayer, assistant manager, technical section, E. I. duPont de Nemours & Co.; "Difficult Heading Driving and Pumping Problems," C. F. Carothers, general superintendent, Pond Creek Pocahontas Co.; "Engineering Problems in the Construction of Boulder Dam," D. M. Simmons, chief engineer, General Cable Corporation.

There will be a banquet in the evening of the first day's session, and on the following day coal-cleaning plants in the vicinity will be inspected.

Violence Marks Labor Upsets in Several Fields

Labor developments in the coal industry during the last month were marked by acts of violence in widely separated sections of the country. A dynamite blast on Sept. 20 wrecked a section of the narrow-gage railroad connecting an anthracite stripping operation of the Susquehanna Collieries Co. and the Williamstown breaker of the company, near Valley View, Pa. Although it was reported that "bootleg" miners threatened to blow up a shovel and crew if efforts were made to work, the leader of the "independents" promised on the following day that there would be no further violence.

Striking miners of the Brookside colliery of the Philadelphia & Reading Coal & Iron Co., at Tower City, Pa., ignored the request of district union leaders to return to work and voted Sept. 21 to continue their sympathy strike. Approximately 1,200 men were idle, supporting a walk-out of 60 contract miners in protest against changes in working conditions. A strike lasting nearly a month in the St. Nicholas division of the same company ended Sept. 19, when 6,000 miners in seven mines were ordered back to work, pending working out of a plan for equalization of work similar to one in effect in the Panther Valley. Resumption was planned for operations at St. Nicholas, West Shenandoah, Mahanoy City, Hammond, Turkey City, Maple Hill and Knickerbocker.

A climax to a long period of violence in the Harlan County field of Kentucky was reached Sept. 4 when County Attorney Elmon Middleton was killed by a dynamite charge wired to the engine of his automobile as it stood in front of his home. The County Attorney, a cousin of Sheriff Theodore R. Middleton, was a bitter foe of union organizers in the Harlan field. He had prosecuted many alleged law violators rounded up by his cousin-sheriff.

After five weeks' idleness, 550 employees of the Railway Fuel Co.'s Parrish (Ala.) mine returned to work during the first week of September. The men had quit in a body rather than submit to the laying off of 165 miners as a curtailment measure. In settling the difficulty, the Southern Ry., which owns and operates the mine, took back all the men.

An explosion, said to have been due to a bomb, wrecked the engine room of the Valier Coal Co. at Valier, Ill., on Aug. 26 causing damage to the building and machinery estimated at $150,000. The mine, which had a contract with the United Mine Workers, was to have been reopened soon.

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COAL TO SHARE IN REA PLANS

A large share of the $100,000,000 fund of the Rural Electrification Administration will be used for rural line extensions from existing steam plants. This cheering news for the coal industry was disclosed Sept. 20 by George J. Leahy, chairman of the National Job Saving and Investment Protection Bureau for the Coal Industry, on receipt of a reply to an inquiry to Morris L. Cooke, director of REA.

"Because the far greater share of electric power is generated in steam plants," said Mr. Cooke, "most of the extensions which we provide will increase the demands upon those plants . . . It would be impossible, of course, to discriminate against hydro-electric plants. Our money is to be used for the extension of distribution systems wherever self-liquidating projects are worked up. We prefer and expect to utilize existing sources of energy as we find them, instead of creating new ones."

Complete rural electrification, connected to coal-consuming generating plants, according to Mr. Leahy, would require an annual consumption of 6,000,000 additional tons of coal, giving employment to 7,500 coal miners and more than 3,500 railroad employees.

Industrial Notes

Nelson J. Darling, manager of the River works of General Electric Co., also has assumed management of the West Lynn (Mass.) plant. F. P. Cox retired Sept. 1 as manager of the West Lynn plant after 45 years' service with the company. N. M. Du Chemin, formerly superintendent of the West Lynn works, has been made assistant manager in charge of operations there.

Koehler Mfg. Co., Marlboro, Mass., announces the appointment of A. C. Dick as sales engineer. He recently left the Westinghouse Lamp Co., where he was engaged in lamp engineering and lighting design.

T. I. Phillips has been appointed general works manager of Westinghouse Electric & Mfg. Co., after twenty years' service with the company. He succeeds C. H. Champlain, who retired because of a prolonged illness.

Ajax Flexible Coupling Co., Westfield, N. Y., has moved its Philadelphia (Pa.) sales office to the Otis Building.

Carbondale Machine Corporation, Harrison, N. J., recently organized as a subsidiary of Worthington Pump & Machinery Corporation to manufacture refrigeration, ice-manufacturing and air-conditioning equipment, has elected the following officers: H. C. Ramsey, president; H. A. Feldbush, vice-president; A. H. Baer, vice-president in charge of sales; and A. L. Prentice, secretary-treasurer.

John W. Carpenter, for sixteen years sales manager in Cleveland (Ohio) territory for the Otis Steel Co., has joined Republic Steel Corporation as assistant manager of sales, sheet and strip division. J. P. Distler has been appointed manager of sales, wire division, with headquarters

at the Grand Crossing plant, Chicago. He succeeds R. W. Hull, who will devote his entire time to the duties of assistant manager of sales for all Republic products in the Chicago district.

General Refractories Co., Philadelphia, Pa., announces the appointment of Charles A. Strelinger Co., Detroit, Mich., as agent in the motor city area.

William A. Briggs will be in charge of the Southern sales district of the Boston Woven Hose & Rubber Co. after Oct. 1, with headquarters at Atlanta, Ga. He has been in the company's employ more than thirty years.

Babcock & Wilcox Tube Co., Beaver Falls, Pa., announces the appointment of R. P. Kilsby to managership of its Western sales territory, with headquarters in the company's Chicago office.

Don S. Walker has been appointed district manager in the Philadelphia (Pa.) office of Combustion Engineering Co., Inc., where he will be responsible for sales also in the Washington (D. C.) territory.

Mine Fatality Rate Rises

Coal-mine accidents caused the deaths of 58 bituminous and 19 anthracite miners in July, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. This compares with 68 bituminous and 28 anthracite fatalities in the preceding month, and 91 bituminous and 15 anthracite deaths in July, 1934. With a production of 22,252 tons, the bituminous death rate in July was 2.61 per million tons, compared with 2.26 in the preceding month, when 30,067,000 tons was mined, and 3.66 in July, 1934, in mining 24,869,000 tons. The anthracite fatality rate in July was 5.35, based on an output of 3,549,000 tons. In the preceding month the rate was 4.96 on an output of 5,642,000 tons, and in July, 1934, it was 4.36 in producing 3,443,000 tons. For the two industries combined, the death rate in July was 2.98, against 2.69 in the preceding month and 3.59 in July, 1934.

Comparative fatality rates for the first seven months of 1934 and 1935, by causes, are given in the following table:

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

Cause	Bituminous Number killed	Bituminous Killed per million tons	Anthracite Number killed	Anthracite Killed per million tons	Total Number killed	Total Killed per million tons
January-July, 1934						
Falls of roof and coal	299	1.443	87	2.403	386	1.586
Haulage	86	.415	17	.469	103	.423
Gas or dust explosions:						
Local explosions	8	.039	10	.276	18	.074
Major explosions	...	.....	..	.....	...	.....
Explosives	18	.087	10	.276	28	.115
Electricity	28	.135	3	.083	31	.128
Machinery	10	.048	2	.055	12	.049
Surface and miscellaneous	60	.290	32	.884	92	.378
Total	509	2.457	161	4.446	670	2.753
January-July, 1935						
Falls of roof and coal	269	1.276	87	2.702	356	1.465
Haulage	116	.550	18	.559	134	.551
Gas or dust explosions:						
Local explosions	10	.047	7	.217	17	.070
Major explosions	9	.043	13	.404	22	.090
Explosives	20	.095	10	.311	30	.123
Electricity	16	.076	...	.....	16	.066
Machinery	13	.062	1	.031	14	.058
Surface and miscellaneous	52	.246	43	1.336	95	.391
Total	505	2.395	179	5.560	684	2.814

*All figures subject to revision.

WAGNER LABOR ACT INVALID, SAYS LAWYERS' REPORT

Certain phases of the Wagner-Connery National Labor Relations Act are unconstitutional according to a report by the lawyers' vigilance committee of the American Liberty League made public Sept. 19. The committee held that the act violated the constitutional guarantee that no person shall be deprived of life, liberty or property without due process of law. It also charged that the law went beyond the powers that the Constitution gives Congress over interstate commerce. The act's provision that representatives chosen by a majority of employees shall have the right to bargain collectively for all employees was called "an illegal interference with the individual freedom of employees."

The committee includes 58 prominent lawyers of diverse political faiths in all parts of the country. The report was prepared by a subcommittee under the chairmanship of Earl F. Reed, attorney for the Weirton Steel Co.

Harold L. Ickes, Secretary of the Interior, characterized the report as "gross impertinence and flagrant impropriety," adding that he understood the Supreme Court was still operating under the Constitution and that "it was evidence *per se* of disrespect of the court" for these lawyers to rule publicly on the constitutionality of a law before the court had made a decision.

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Colorado Operators Organize

Fremont County Coals, Inc., composed of major producers in Fremont County, Colorado, was organized Sept. 4 at Florence, Colo. S. R. Hahn, president of the Fremont County Coal Operators' Association, which the new organization displaces, assisted in the formation of the new body. The following officers were elected: Frank Orecchio, president; William J. Beers, vice-president; Adolph Fiorina, secretary-treasurer. Directors include the officers and Anthony Santarelli, Charles J. Caldirola, D. L. Hansen and Joseph Berta.

How to Abate Smoke Evil For Aviation Told

Wider use of smokeless solid fuels and gas or the installation of improved equipment to burn soft coal and oil inoffensively is prescribed for the protection of established air fields which are bothered by city smoke, as the result of a study by Mellon Institute of Industrial Research, Pittsburgh, Pa., of the relation of urban smoke to the future of aviation. For new airports, location on the windward side of smoky cities is advised. The study was made as a consequence of inquiries indicating that smoke from industrial communities was retarding the expansion of private flying. H. B. Meller, head of air pollution investigation, and L. B. Sisson, holder of the smoke abatement fellowship, Mellon Institute, conducted the invesigation, with the cooperation of specialists in meteorology, aviation engineering and commercial aviation.

Buys New Mine Cars

The Panther Creek Coal Co., Springfield, Ill., recently ordered 100 mine cars from the Sanford-Day Co. Specifications call for equipment with a rated capacity of 4½ tons, 2½-in. axles and Timken bearings.

John E. Morris Is Dead

John E. Morris, 64, formerly in charge of collieries for the Lehigh Valley and the Alden coal companies, died Sept. 11 at Forty Fort, Pa. He had been associated with the anthracite industry for many years up to the time of his retirement.

Financial Reports

Crow's Nest Pass Coal Co., Ltd.—Net income for quarter ended June 30, $38,475 after depreciation and depletion but before federal taxes; net income for six months, $93,182.

Hatfield Campbell Creek Coal Co. and subsidiaries—Net income for six months ended June 30, $86,834 after depreciation but before federal taxes, compared with $82,870 before federal taxes a year ago.

Island Creek Coal Co. and subsidiaries—Net profit for six months ended June 30, $155,646 after depreciation, depletion, taxes and other charges, against $267,738 profit in the first half of 1934.

Lehigh Coal & Navigation Co.—Consolidated net income for year ended June 30, $536,749 after interest, taxes, depreciation, depletion and other charges, and including company's proportion of undistributed earnings and losses of

subsidiaries whose stock the company owns or controls. This compares with profit of $1,810,572 in preceding year.

Lehigh Valley Coal Corporation—Net income for six months ended June 30, $475,575 after depreciation, depletion, interest, minority interest and other charges, against profit of $586,596 in first half of 1934. Net income for quarter ended June 30, $104,976, compared with net loss of $143,925 in second quarter of 1934.

Pacific Coast Co.—Net loss for quarter ended June 30, $86,063 after expenses, interest, depreciation, depletion, taxes, and other charges, compared with loss of $3,629 in preceding quarter and loss of $104,158 in second quarter of 1934.

Penn Anthracite Collieries Co. and subsidiaries—Net loss for year ended Dec. 31, $274,950 after interest charges, compared with net loss of $393,366 in the preceding year.

Pennsylvania Coal & Coke Corporation and subsidiaries—Profit for quarter ended June 30, $10,733 after ordinary taxes, depreciation and depletion, but before federal taxes, compared with loss of $93,984 in June quarter of 1934. Profit for six months ended June 30, $105,526.

Pittsburgh Terminal Coal Corporation—Net loss for quarter ended June 30, $134,446 after depreciation, depletion and other charges, compared with loss of $89,441 in June quarter of 1934. Net loss for six months ended June 30, $203,821, compared with loss of $171,622 for first half of 1934.

Pond Creek Pocahontas Co. — Net profit for quarter ended June 30, $29,817 after depreciation, depletion, taxes and other charges, compared with $96,826 in June quarter of 1934. Net profit for first half of 1935, $155,646, against $267,-638 a year ago.

United Electric Coal Cos. and affiliate—Net loss for year ended July 31, $52,283 after taxes, interest, amortization, royalties, depreciation, depletion and other charges, compared with $127,457 loss in preceding year.

Virginia Iron, Coal & Coke Co.—Net loss for quarter ended June 30, $29,550 after depreciation, interest, taxes, depletion and other charges, compared with net loss of $46,377 in second quarter of 1934. Net loss for six months ended June 30, $20,605, against loss of $46,426 in first half of 1934.

West Virginia Coal & Coke Corporation—Net profit for three months ended June 30, $77,115 after depreciation, interest, depletion, federal taxes and other charges, compared with $21,342 profit in second quarter of 1934. Net profit for six months ended June 30, $340,473, against $108,639 a year ago.

LETTERS
To the Editor

Mining Lubrication

If the inconvenience, depreciation of machinery, power costs and loss of production due to carelessness or improper lubrication could be shown up in their true form, the study of lubricants certainly would save much money—especially at this time when so much manual labor is being replaced by machines. I recall that when I was only in my teens, I was much surprised when told the price of grease used on machinery I was studying. "Goodness!" I exclaimed, "that grease is much dearer than butter."

But the buyers of such grease believed in efficiency and economy, shown by the care given such engines and the reward obtained in good resulting constant running action, durability of such engines, always acting and looking like new. Prior to this instance I had had a good lesson on the value of grease. I had occasion to use a water car which was not greased, since it never had occasion to travel over some automatic greaser. The difference in manpower to push such an ungreased car and one that is greased ought to be tried by those who have to cover the cost of doing so. I'll venture to say much more greases and lubricants would be used.

Another instance of very recent date was brought to my attention by one of my sons, who inspects, etc., and lubricates loading machines. In talking and discussing such machinery, he brought out the factor of grease, good and bad, and the properties and action of certain greases. Being interested deeply in his work and anxious to make good, he had his mind set that the successful, efficient, economical running of such machines meant his success and would outweigh human prejudices and jealousies. He found a certain grease was not acting as he desired. He made known again and again the discrepancy. The grease was foaming too much and expanding and running away to waste. He told what the ultimate result would be, of which he was much concerned and wished to avoid, and the results were just as he foretold those above him. I give this only to show that when one uses grease, do not try false economy by using low-first-cost, poor-quality, inefficient greases or lubricants.

Now he has the satisfaction of knowing that while lubricants allowed per machine by the manufacturer, if I am rightly informed, was calculated to average (approximately) 10 lb. per 8-hour day, the machines under his care had above average success with lubricant use of 7.8 lb. per machine per 8-hour day. The average consumption was said to be by a large company 22.4 lb. per unit per 8-hour day, the worst mine or unit of machine under such company being as bad as 30.4 lb. per unit per 8-hour day.

What does it mean to use good lubricants and use them right, as per inefficient lubricants inefficiently used? If I think right, I believe the lubricants cost to the company runs around $32,000 per annum. Then,

22.4 lb. : 7.8 lb. : : $32,000 :

What cost may be cut to,

Average consumption : Low consumption : : Total cons. cost : Low consumption cost

$$\frac{7.8 \times 32{,}000}{22.4} = \$11{,}143$$

$$\$32{,}000 - \$11{,}143 = \$20{,}857 \text{ saving}$$

If the low-average grease cost could have taken the place of the average cost, saying nothing of the highest cost, and my son thought there was too much waste even in the low rate of grease consumption:

Low cost total, say.....$11,143 plus
Average cost total, say.. 32,000
High cost total, say.... 43,428 plus

To me, just a coal loader, these figures make me think. Then again, consumers can give a deep second thought to the serious divergence of cost in transporting $11,143 worth of lubricants and maybe $43,428 worth; then again the difference in labor cost to put $11,143 worth of grease and $43,428 worth to the various parts of mechanical loaders. Lubrication, even to me, only a coal loader, is certainly well worth while study.

W. H. LUXTON
Linton, Ind.

Worms and Fishes

Some authority has it that the Carboniferous period, or Coal Age, was about 250 million years and that this period was some 600 million years ago. And now you ask, Mr. Editor, "Did worms extract ash in the coal laid down in that far-off era?" (*Coal Age*, February, 1935, p. 52). And I answer that the stored-up sunlight or plant life, which turned carboniferous as the immense coal beds were formed, does not seem to have been worm-eaten.

We are marketing some famed cannel coal, which is of a semi-bird's eye type. This bed frequently shows the ancient plant formation in its true form within the coal structure. Thus, I could hardly divine that the ancient fiber was ever worm-eaten or otherwise teased.

Your editorial, "Fit for Fish" (May, 1935, p. 182), seems worthy of much discussion before any laws should govern such a varied lot of conditions relative to offensive acid in mine waters. Many mine waters will be found non-offensive to the propagation of fish. Many mines will be found in localities where the fish possibilities are nil, worthless or not worthy of any consideration by lawmakers.

It would require careful inspection of the important fish-producing streams, etc., to determine the right of the public to demand laws for fish protection, for, if the question of fish life should arise, the question of undue cost burden should also arise.

E. A. SMITH, *Chief Engineer,*
Wells-Elkhorn Coal Co.,
Estill, Ky.

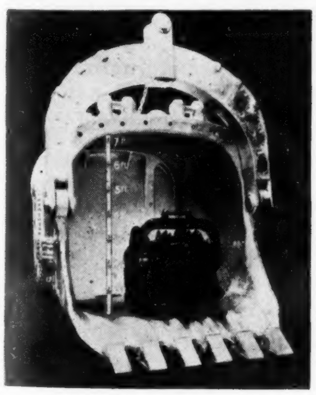
WHAT'S NEW

In Coal-Mining Equipment

SHOVEL DIPPER

American Manganese Steel Co., Chicago Heights, Ill., now offers composite-type power-shovel dippers with design and use of aluminum alloy and high-tensile rolled steel for parts not subject to abrasion combining to effect a substantial reduction in weight. In the larger sizes, according to the company, weight can be less than half the solid all-cast type. Illustrated is a 15-cu.yd. composite dipper supplied to the Commercial Fuel Co. to replace a 12-cu.yd. solid dipper on its Marion 5320 shovel. Weight of the new dipper is 32,940 lb., compared with 74,000 lb. for a 15-cu.yd. all-manganese-steel dipper made several years ago.

Top castings in this composite design, the company states, are manganese steel featuring complete double-wall construction with integral bases and bail connections. The manganese-steel bottom casting also is made with a double wall where the dipper stick is connected.

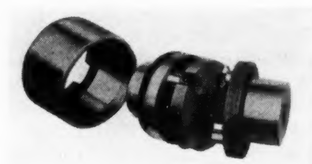


Front plates are high-tensile rolled steel welded with spacers to form a double wall between top and bottom castings. The back plate is rolled aluminum alloy, while the back braces connecting top and bottom castings are cast aluminum alloy. The door is a one-piece manganese-steel casting with integral hinges.

Composite dippers, the company points out, will not stand the abuse that the same-capacity all-manganese-steel dipper will take, but for medium work where a plate- or cast-steel dipper affords sufficient strength, the composite dipper will show greater economy through the impact and wear resistance of the exposed manganese-steel parts.

COUPLINGS

Alloy Products Corporation, Waukesha, Wis., offers "Lifetyme Uniflex" couplings for use in direct-connected drives. Features of the coup-



lings, according to the company, include self-adjustment to compensate for parallel as well as angular misalignment—as much as $\frac{5}{16}$ in. in the case of parallel and 3 to 6 deg. in the case of angular misalignment; elimination of shimming; noiseless operation; reduction of power losses; and long life.

GOGGLE

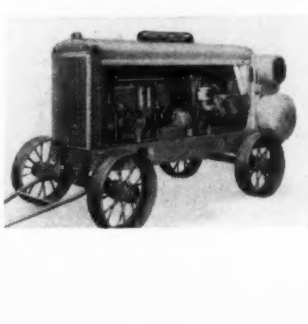
American Optical Co., Southbridge, Mass., offers the new F3100 "Ful-Vue" goggle, which it describes as exactly like the Ful-Vue spectacles in appearance and in many design features. Major advantages, according to the company, are handsome appearance and comfort. For the customary nosepiece the new goggle substitutes pearl full-rocking nose pads which distribute the slight weight of the goggle on the sides rather than on the top of the nose. Earpieces are of completely insulated flexible cable, so that no metal touches the skin at any point. These earpieces are set high on the

rims, thus removing every obstruction from full side vision and adding to appearance.

Comfortable fitting, the company points out, is facilitated by the adjustable nose-pad supports fitted with universal swivels allowing the pads to conform automatically to the contour of the nose. The goggle is fitted with the new six-curve "Super Armorplate" lenses, said to be able to withstand blows approximately twice as heavy as standard lenses. The domed surface of the lens, shaped to fit closely to the eye without interfering with brows or lashes, is declared to be exceptionally effective in deflecting glancing blows.

COMPRESSORS

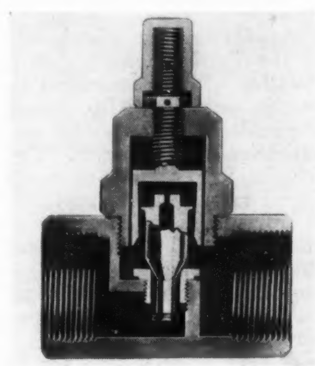
Four models of "Aero-2-Stage" portable compressors for delivering 105, 160, 210 and 315 c.f.m. (A.S.M.E. standard test) are now offered by the Worthington Pump & Machinery Corporation, Harrison, N. J. Known as Models 105, 160, 210 and 315, respectively, these units are designed, according to the company, for high efficiency and long life with delivery of the greatest volume of air at



lowest fuel and maintenance costs. The units are described as balanced-angle, two-stage, air-cooled, unit assembly, with clutch connection to heavy-duty, 6-cylinder gasoline engines; speed, 830 r.p.m.; air pressure, 100 lb. per square inch gage. A wide variety of mountings are available, including mine-car, rail-car and truck types. The compressors are equipped with improved feather valves, ring-type cooling fins, articulated connecting rods, drop-forged crankshafts, Timken bearings, spray and forced-feed lubrication, oil filters and V-belt-driven fans.

STEAM TRAP

Yarnall-Waring Co., Philadelphia, Pa., offers the Yarway impulse steam trap in six sizes from ½ to 2 in. Size of the trap, according to the company, is little more than a pipe union. Materials are: body, cold-rolled steel; working parts, hard Monel; bonnet and cap, brass. Each trap is factory-set to operate on all pressures from 0 to 400 lb. per square inch. The trap depends for operation on the differences in the flow characteristics of cold water, hot water and live steam flowing through two orifices with a chamber between, and the valve disk is the only moving



part. Movement of the disk is governed by variations in pressure in the space above the valve piston resulting from changes in the temperature of the condensate.

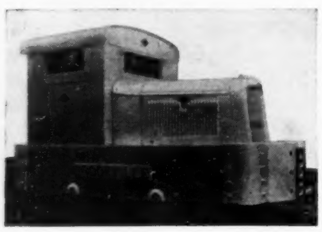
RUBBER BELT

Boston Woven Hose & Rubber Co., Boston, Mass., has announced a new method of vulcanizing transmission belts which it asserts eliminates many of the disadvantages in vulcanization — usually in 30-ft. sections—in the flat-bed presses commonly used. With the flat-bed press, the company

states, narrow strips at intervals are subject to double vulcanization and to undue mechanical stress on the fabric, thus shortening belt life. With the continuous method of vulcanizing developed by the company, the following advantages, it is declared, result: greater durability and better performance at no increase in cost; elimination of destructive double vulcanization caused by press laps with consequent rapid deterioration and other troubles; uniform stretch throughout the length of the belt; increase of 30 per cent in coefficient of friction; material reduction in "bootlegging"; and higher quality of belt body.

LOCOMOTIVE

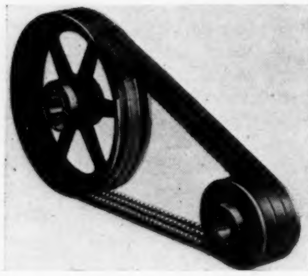
Brookville Locomotive Co., Brookville, Pa., announces a new series of 2½- to 6-ton locomotives powered with the Ford V-8 engine and employing the Ford four-speed truck transmission and new Ford



heavy-duty truck clutch—all of the Ford assembly being installed without alteration to permit servicing with standard replacement parts by any authorized Ford dealer. The Brookville reverse makes all four forward speeds available in reverse. Other features cited by the company are: steel-tired drive wheels, which increase traction 25 per cent; dual-spring journal suspension for good riding qualities over poor track at high speed; Timken bearings; structural-steel frame; five-pocket link-and-pin couplers; and all-steel cab.

OIL PROOF BELT; CAST PULLEY

Dayton Rubber Mfg. Co., Dayton, Ohio, announces a new belt bearing the name "Daycoil," which it states is the first completely oilproof V-belt developed for general industrial use. "Dayco," the oilproof material used in the construction of Daycoil V-belts, has, according to the company, all the properties of natural rubber, such as flexibility, plasticity and re-



Cast-machined "Day-Steel" pulleys

siliency, plus aging properties many times that of rubber and much greater abrasive- and wear-resisting qualities when subjected to oils and solvents. The Daycoil belt also is characterized by the same principles of laminated construction as the regular Dayton "Cog-Belts."

The company also offers a complete line of cast-machined (semi-steel) "Day-Steel" pulleys for use with Cog-Belt drives up to 15 hp. Maximum strength with elimination of excess metal are cited by the company, thereby providing cast-machined pulleys of approximately the same weight as the pressed-steel pulley, which the organization will continue to offer. All finished surfaces of the cast-machined type, it is stated, are machined to the accurate limits of precision work, the special semi-steel providing an exceptionally smooth and close-grained groove surface. All pulleys are balanced accurately, and a high-quality finished groove is mentioned as providing both protection and outstanding appearance.

SWITCHES

Delta-Star Electric Co., Chicago, offers a new line of group-operated 3-pole indoor connecting switches with tongue-type contacts, double blades and an operating mechanism which can be locked in either open or

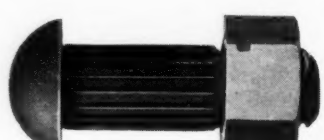
closed position. Straight, front or back connections, or combinations are available, according to the company. The base is of steel arranged for either flat or pipe mounting, and the connecting rod between the switch mechanism and the operating handle can be any desired length.

COUPLING

A newly patented magnetic-clutch coupling said to insure positive, quick engagement and disengagement with less than 1¼ deg. of slip is announced by the Dings Magnetic Separator Co., Milwaukee, Wis. It is designed for application where positive engagement and remote control are necesary or desired. The Type SCC clutch, according to the company, transmits unusually high torque—five times that of the ordinary friction-type clutch of the same diameter and of either the single- or multiple-disk design.

RIB BOLT

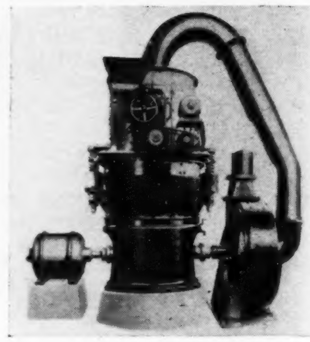
Automatic Nut Co., Inc., New York City, offers the new structural rib bolt for use in erection of steel work in conjunction with the automatic nut. The bolt is made with the standard American Boiler Makers' Association button head, and the ribs embed themselves in the wall of the hole and thus make a tight fit. With standard



U.S.S. thread, the bolt is made of carbon-manganese steel (minimum tensile strength, 70,000 lb. per square inch), and is available either black or galvanized. The only equipment necessary for its use, the company states, are a hand hammer and wrench. All sizes and lengths are available.

PULVERIZER

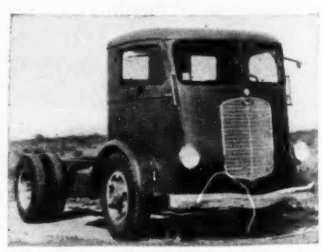
Combustion Engineering Co., Inc., New York City, now offers the Raymond bowl mill, which it describes as a radical departure from conventional types of pulverizers and capable of giving uninterrupted operation over long periods of time without shutdowns. The design, it is



stated, assures low friction losses and consequently low power consumption, quiet operation and low maintenance resulting from the elimination of metal-to-metal contact between the bowl and the rolls. Speed is constant with the output controlled by varying the rate of feed, and the mill power is almost directly proportional to the load, the company declares. The mill is adaptable to either direct firing or storage systems. For coal grinding and firing, the mill is equipped with an air separator and automatic feeder, both mounted on the top plate. The mill, according to the manufacturers, is ideally suited to direct firing because it runs at a constant speed and the output is controlled by varying the rate of feed.

TRUCKS

Modernly styled streamlined coupé cabs with integral all-metal roof construction are features cited for the improved CH and CJ "Traffic-Type" cab-over-engine trucks offered by Mack Trucks, Inc., New York City. Another feature noted for the new units is the use of a "roll-out" power plant, which permits the withdrawal of the power plant as a unit through the front, thereby greatly increasing engine accessibility. The new trucks also have shorter wheelbases for given



platform lengths, made possible by further setting back the front axle. Mechanical details remain unchanged, the CH being powered by a 108-hp. and the CJ by a 118-hp. engine.